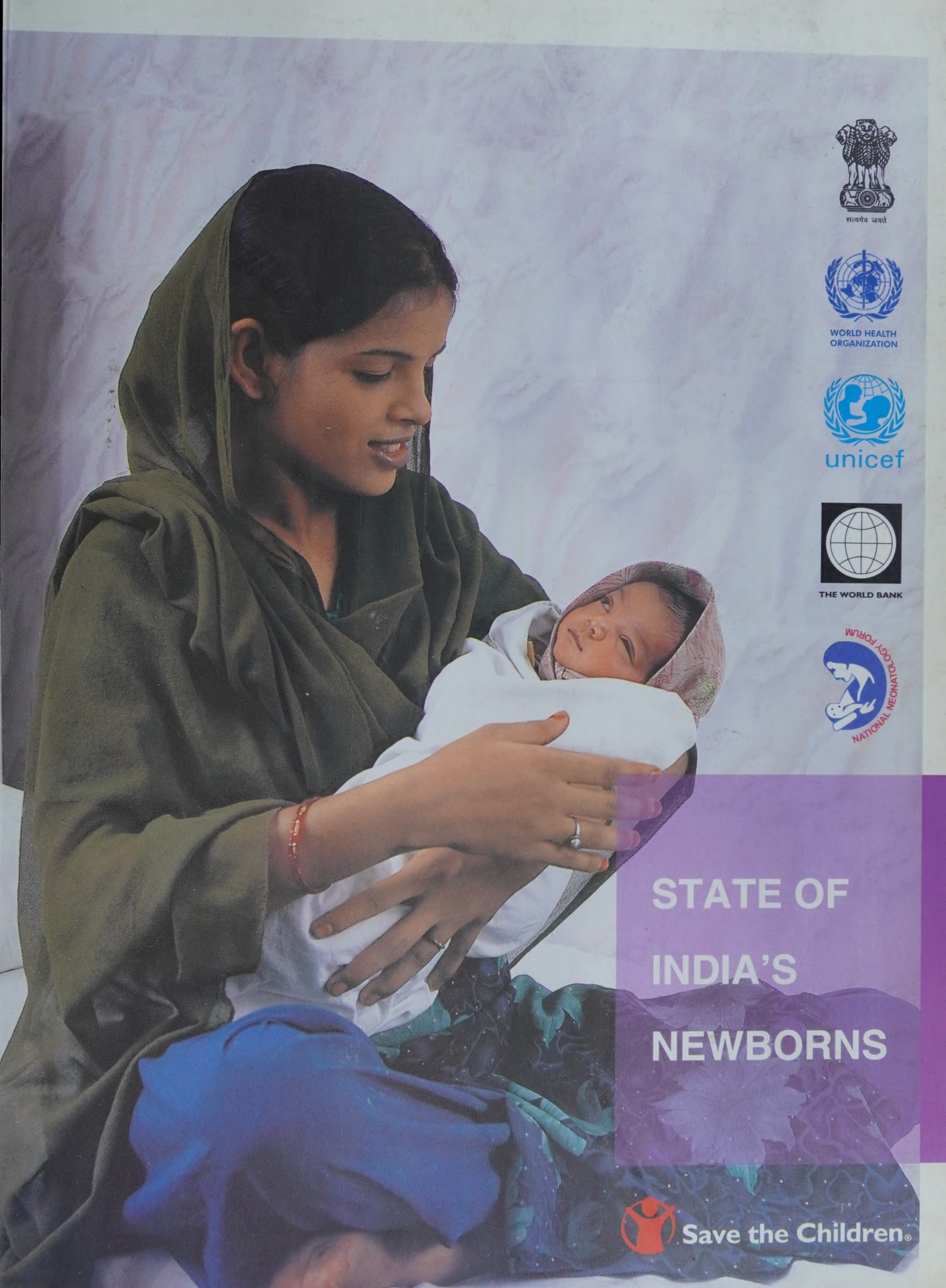

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WORLD HEALTH ORGANIZATION

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THE WORLD BANK

NATIONAL NEONATOLOGY FORUM

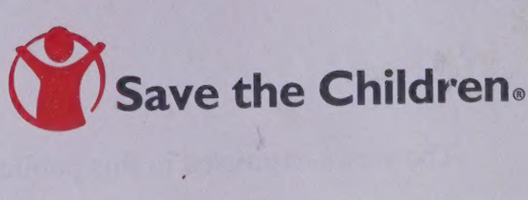
STATE OF INDIA'S NEWBORNS

Save the Children

India: State-wise Neonatal Mortality Rate

Based on SRS 2000 estimates except for some states (namely, Jammu and Kashmir, Delhi, Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Sikkim, Mizoram and Goa) for which NFHS II 1998-99 was used

STATE OF INDIA'S NEWBORNS



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in partnership with the
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GOVERNMENT OF INDIA
DEPARTMENT OF FAMILY WELFARE
MINISTRY OF HEALTH & FAMILY WELFARE
NIRMAN BHAVAN, NEW DELHI - 110011

Dated the 12th April, 2004

FOREWORD

Newborn health is the key to child survival, especially for India. Globally, 3.9 million neonatal deaths constitute 36% of the under –5 child deaths. But in India, with nearly 1.2 million deaths each year in the first four weeks of life, the proportion of under-5 child deaths occurring in the neonatal period is almost half. Thus the challenge of child survival in India today can only be met by saving newborn lives in large enough numbers, in homes and facilities, and in villages, towns and cities. India has the necessary health system foundation, technical strength, educational base, research infrastructure and a robust private sector. Therefore, it is possible for us to embark on an extraordinary effort, with the help of partners, to achieve low levels of neonatal mortality in near future.

India took the lead in incorporating essential newborn care into the national programme way back in 1992, much before neonatal health appeared on the international health agenda. The National Population Policy (2000) explicitly recognizes neonatal care as a priority. In the 10th Five Year Plan (2002-2007), specific resource allocation has been made for neonatal care, and country and state-level targets listed for neonatal mortality rates (NMR). The Child Survival and Safe Motherhood Programme (1992-97) and the ongoing Reproductive and Child Health Programme phase – I (1997-2005) have provided useful learning experiences and built a strong platform on which a more ambitious newborn health strategy can now be launched. The country is presently designing the second phase of the Reproductive and Child Health Programme (2005-2010). We are aiming at extend the continuum of newborn care, from maternal to post-natal interventions, to all newborn infants at household, community and facility levels. Integrated Management of Neonatal and Childhood Illness (IMNCI) approach will be introduced to provide home-based newborn care through grassroots workers. Primary Health Centres, Community Health Centres and First Referral Units will be strengthened to provide 24-hour maternal, newborn and child care services by deploying a large number of nurses apart from physicians and others. The Government looks upon RCH II programme as a turning point for neonatal survival in India.

The 'State of India's Newborns' report is indeed a timely initiative. The Report captures the key elements of the epidemiology of newborn health and survival, traces the evolution of newborn care in Government and non-Government sectors, projects an equity-driven vision for newborn health for near future, and analyses core issues critical to an accelerated march towards that vision. It is an excellent reference resource on newborn health in India for a multi-faceted national and international audience.

I congratulate the National Neonatology Forum and the Saving Newborn Lives for this superb piece of creative and programme-relevant work.

(PRASANNA HOTA)

Introduction

It is with a sense of fulfillment that we present this report on the State of India's Newborns (SOIN).

The SOIN is a treatise on newborn health in India, the country with the highest burden of childbirths and neonatal deaths. It covers the burden and trends in neonatal and maternal mortality, provides an overview on the policies, programs and services related to newborn health, summarizes newborn care initiatives and programs of the NNF and other partners, identifies programmatic, research and advocacy gaps, and proposes a way forward. The SOIN has also attempted to encapsulate a large body of program-relevant research from the country. It is a tribute to the researchers in India that the county has contributed more literature and evidence on newborn health issues than any other developing country.

This report is appearing at a unique time. India is launching the second phase of the Reproductive and Child Health (RCH II) program early next year. The SOIN, could, in a sense, serve as the baseline situational analysis for RCH II. The RCH II program encompasses a comprehensive newborn health strategy covering household, community and facility level activities. A unique feature of India's RCH program is that it integrates maternal, neonatal and child health services. The most important beneficiary of this attribute is the neonate who almost always falls between the cracks if safe motherhood and child health programs are not integrated at the planning and implementation stages. India's strategy is also path-breaking in another respect. It incorporates a newborn-centric IMNCI (Integrated Management of Neonatal and Childhood Illness) approach, a unique feature of which is the home-based newborn care package to be delivered by community health workers. Not surprisingly, there is a global interest in ensuring success of India's march towards the National and Millennium Development Goals in maternal, newborn and child health.

We are indeed honored by the participation of the Ministry of Health and Family Welfare in preparing this report. The Government of India's commitment to the newborn cause has been long-standing, unstinted and, indeed, exemplary. Our partnership with UNICEF India is very special. Laudable work of UNICEF on newborn care training and operationalization in many states, and on IMNCI implementation more recently, has opened up new approaches for newborn survival and health in the country. WHO has provided outstanding leadership and technical support to newborn health policy, program and research in India and the South East Asia Region. We are proud of WHO's association with the SOIN. It is a special privilege for us to have sponsorship of the World Bank. As a lead partner of India's RCH program, the Bank has always been an ardent supporter of newborn health.

Most sincerely, we thank all the contributors, reviewers, advisors and the editorial team for rich inputs that have gone into shaping this superb piece of creative work. A special thanks to Dr. Vinod Paul who has unstintingly given of his time and expertise for the planning and production of this report.

With the hope that this work would serve as a catalyst for saving many newborn lives in India and beyond, we most humbly dedicate this report to the future mothers and children of India on the 135th birth anniversary of the Father of the Nation, Mahatma Gandhi.

Armida Fernandez
National Neonatology Forum

2nd October, 2004

Anne Tinker
Saving Newborn Lives, Save the Children

Abbreviations

AAP	American Academy of Pediatrics
ACASH	The Association for Consumer Actions on Safety and Health
AIIMS	All India Institute of Medical Sciences
AMDD	Averting Maternal Death and Disability
ANC	Antenatal care
ANM	Auxiliary nurse midwife
ARI	Acute respiratory tract infection
ARTH	Action Research and Training for Health
AWW	Anganwadi worker
BARC	Bhabha Atomic Research Centre
BCC	Behavior change communication
BCG	Bacillus Calmette-Guerin
BDCS	Border District Cluster Strategy
BFHI	Baby Friendly Hospital Initiative
BIND	Bilirubin induced neurological damage
BPNI	Breastfeeding Promotion Network of India
BW	Birth weight
CARE	Cooperative for Assistance and Relief Everywhere
CASP	Child Aid and Sponsorship Program
CBR	Crude birth rate
CEDPA	Centre for Development of Population Activities
CFR	Case fatality rate
CHC	Community health center
CHG	Community health guide
CLSBA	Community-level skilled birth attendant
CS	Child survival
CSSM	Child Survival and Safe Motherhood
CVP	Children's Vaccine Program
DALYs	Disability Adjusted Life Years
DFID	Department for International Development
DGIS	Netherlands Ministry for Development and Cooperation
EBF	Exclusive breastfeeding
EBT	Exchange blood transfusion
EmOC	Emergency obstetric care
ENCI	Evidence-based newborn care initiative
ENMR	Early neonatal mortality rate
EPI	Expanded program on immunization
ESBL	Spectrum beta lactamase
FOGSI	Federation of Obstetric and Gynecologic Societies of India
FP	Family planning
FRU	First referral unit
G6PD	Glucose-6-phosphate dehydrogenase
GDP	Gross domestic product
GNM	General nurse midwife
GOBI	Growth and Development, Oral Rehydration, Breastfeeding, and Immunization
HNP	Healthy Newborn Partnership
HR	High-risk
IAP	Indian Academy of Pediatrics
IBFAN	International Baby Food Action Network
ICDS	Integrated Child Development Services
ICLEN	Indian Clinical Epidemiology Network
ICMR	Indian Council of Medical Research
ICPD	International Conference on Population and Development
IEC	Information education and communication
IFPS	Innovations in Family Planning Services
IIHFW	Indian Institute of Health and Family Welfare
IMA	Indian Medical Association
IMCI	Integrated Management of Child Illness
IMNCI	Integrated Management of Neonatal and Child Illnesses
IMR	Infant mortality rate
IMS	Infrastructure Management Services

INHP	Integrated Nutrition and Health Project
ISOPARB	Indian Society of Perinatologists and Reproductive Biologists
IMS	Infrastructure Management Services
INHP	Integrated Nutrition and Health Project
IUGR	Intrauterine growth restriction
JHU	Johns Hopkins University
JSY	Janani Suraksha Yojana
KGMU	King George Medical University
KMC	Kangaroo mother care
LBW	Low birth weight
LHV	Lady health visitor
LNMR	Late neonatal mortality rate
MBBS	Bachelor of Medicine and Bachelor of Surgery
MCH	Maternal and Child Health
MDG	Millennium development goal
MH	Maternal health
MIB	Ministry of Information and Broadcasting
MICS	Multi Indicator Cluster Survey
MIS	Management of Information System
MMR	Maternal mortality ratio
MO	Medical officer
MTP	Medical termination of pregnancy
MVA	Manual vacuum aspiration
NALF	Neonatal advanced life support
NBW	Normal birth weight
NFHS	National Family Health Survey
NMR	Neonatal mortality rate
NNF	National Neonatology Forum
NNPD	National Neonatal Perinatal Database
NRP	Neonatal Resuscitation Program
NNS	Neonatal sepsis
NNT	Neonatal tetanus
PACT-CRH	Program for Advancement of Commercial Technology: Child and Reproductive Health
PATH	Program for Appropriate Technology in Health
PHC	Primary heath center
PMR	Perinatal mortality rate
PNMR	Post-neonatal mortality rate
PRI	Panchayati Raj institutions
RCH	Reproductive and child health
RGI	Registrar General of India
RMP	Registered medical practitioners
RTI	Reproductive tract infection
SAFOG	South Asian Federation of Obstetrician & Gynaecologists
SBA	Skilled birth attendant
SBR	Still birth rate
SC	Scheduled caste
SC	Subcenter
SEARCH	Society for Education Action and Research in Community Health
SEWA	Self-employed Women's Association
SFD	Small-for-dates
SIDA	Swedish International Development Agency
SNL	Saving Newborns Lives
SM	Safe motherhood
SRS	Sample Registration System
ST	Scheduled tribe
STI	Sexually transmitted infection
SWACH	Society for Women and Child Health
TBA	Traditional birth attendant
TNAI	Trained Nurses Association of India
TSB	Total serum bilirubin
TT	Tetanus toxoid
U-5MR	Under-five mortality rate
UIP	Universal Immunization Program
UNAIDS	Joint United Nations Program on HIV/AIDS
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VHW	Village health worker
VLBW	Very low birth weight
WABA	World Alliance for Breastfeeding Action
WHO	World Health Organization
WRAI	White Ribbon Alliance for Safe Motherhood in India

Definitions

Low birth weight: Birth weight less than 2,500 gm.

Still birth: The death of fetus weighing at least 500 gm (or when birth weight is unavailable, after 22 completed weeks of gestation or with a crown-heel length of 25 centimeters or more), before the complete expulsion or extraction from its mother.

Perinatal death: The death of a fetus weighing at least 500 gm (or when birth weight is unavailable, after 22 completed weeks of gestation or with a crown-heel length of 25 centimeters or more) or the death of an infant during the first week of life.

Neonatal death: The death of a live-born infant during the period that commences at birth and ends 28 completed days after birth.

Under-5 mortality rate (U-5MR): Probability of dying between birth and exactly five years of age expressed per 1,000 live births.

Infant mortality rate (IMR): Probability of dying between birth and exactly one year of age expressed per 1,000 live births.

Neonatal mortality rate (NMR): Number of deaths among live births during the first 28 completed days of life per 1,000 live births.

Early neonatal mortality rate (ENMR): Number of child deaths less than 7 days of life expressed as per 1,000 live births in the reference year.

Late neonatal mortality rate (LNMR): Number of child deaths of 7 days to 28 completed days of life expressed as per 1,000 live births in the reference year.

Post neonatal mortality rate (PNMR): Number of child deaths of 29 days to less than 1 years of age expressed as per 1,000 live births in the reference year.

Perinatal mortality rate (PMR): Number of deaths of fetuses weighing at least 500 g (or when birth weight is unavailable, after 22 completed weeks of gestation or with a crown-heel length of 25 cm or more) plus the number of early neonatal deaths, per 1,000 total births.

Still birth rate (SBR): Number of still births per 1,000 births (live and still births) during the reference year.

Maternal mortality ratio (MMR): Number of women dying per 100,000 live births while pregnant or within 42 days of termination of the pregnancy, irrespective of the duration and the site or pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Main Data Sources

Sample Registration System (SRS): SRS is a continuous system of enumeration of births and deaths in 6671 sampling units covering about 1.1 million households and 6.41 million people in all states and union territories by resident post-time enumerators. An independent retrospective survey is carried out every six months by a full-time supervisor for confirmation of data. Data are analyzed and disseminated on an annual basis.

National Family Health Surveys (NFHS): NFHS is a DHS survey conducted every five year. The last survey (1998-99), the NFHS II, covered 89,199 ever-married women (15-45 years of age) in all states. NFHS provides a wide range of data on family planning, reproductive, maternal and child health, and mortality.

National Neonatal-Perinatal Database (NNPD): NNPD was launched by the National Neonatology Forum in 1995. The NNPD network is constituted of leading tertiary level neonatal care centers in the country. These institutions collect and report data on the neonates are born or admitted there using a uniform protocol. A nodal center collates, analyses, and disseminates the findings. Reports for 1995 and 2000 are available, and that for 2002 is being finalized.

Executive Summary

The Newborn Health Challenge

The newborn health challenge faced by India is bigger than that experienced by any other country. Each year, 20 percent of the world's infants—an awesome 26 million—are born in this vast and diverse country. Of this number, 1.2 million die before completing the first four weeks of life, a figure amounting to 30 percent of the 3.9 million neonatal deaths worldwide. India is home to the highest number of both births and neonatal deaths of any country in the world.

The current neonatal mortality rate (NMR) of 44 per 1,000 live births accounts for nearly two-thirds of all infant mortality and half of under-five child mortality. Over one-third of all neonatal deaths occur on the first day of life, almost half within three days, and nearly three-fourths in the first week.

The rate of neonatal mortality varies widely among the different states, ranging from 10 per 1,000 live births in Kerala to around 60 in Orissa and Madhya Pradesh. The undivided states of Uttar Pradesh, Madhya Pradesh, and Bihar together contributed over half of all newborn deaths in India in 2000, or roughly 15 percent of the entire global burden.

There are also significant rich-poor and rural-urban differences: The rate in the poorest 20 percent of the population is more than double that of the richest 20 percent (60 vs. 26), and the rate in rural areas is over one and a half times that in urban areas (52 vs. 34).

The NMR declined rapidly in the 1980s, from 69 in 1980 to 53 in 1990, an unprecedented decrease of almost one quarter in a single decade. In recent years, however, the rate has been static; between 1995 and 2000, there was only a negligible decrease of four points, from 48 to 44 per 1,000 live births. This tapering off in the rate of decline is a cause for concern—and also for decisive action.

Infections, birth asphyxia, and prematurity are the leading causes of neonatal deaths. The incidence of neonatal tetanus, formerly a major cause of mortality, has declined dramatically since the 1980s, but even in the late 1990s, there were still over 48,000 neonatal deaths per year from this entirely preventable disease.

On the basis of community-based studies, the stillbirth rate in India is estimated at 30-35 per 1,000 births, and the perinatal mortality rate at 60-70 per 1,000 births. Thus, there are approximately 0.8 million stillbirths and 1.7 million perinatal deaths each year, the highest burden for any country.
Almost two-thirds of all deliveries occur at home and only 42 percent of these are attended by SBAs. Among pregnant women, only 44 percent have three or more antenatal checkups, although 67 percent receive two or more doses of tetanus toxoid vaccine.

Neonatal health among urban poor communities is emerging as a serious problem. Twenty-eight percent of India's population lives in urban areas, of which more than one-fifth live in slums. Despite a multitude of health facilities and providers, the inequity in the NMR between urban rich and poor (24 vs. 49) is more acute than between the rural rich and poor (37 vs. 57).

The Maternal Health Challenge

India also has the highest burden of maternal mortality in the world. Of the global toll of 529,000 maternal deaths each year, India accounts for one-fourth (136,000). Estimates of the maternal mortality rate (MMR) in recent years have varied from 400-540 per 100,000 live births. Hemorrhage, anemia, puerperal sepsis, obstructed labor , and abortions are the primary causes of maternal deaths in India. In response, India's Child Survival and Safe Motherhood (CSSM) and Reproductive and Child Health (RCH) programs have envisaged promoting better antenatal care (ANC), more institutional deliveries, and more widespread provision of emergency obstetric care (EmOC), but realizing these improvements is taking longer than expected.

Key Newborn Health Issues

Almost eight million low birth weight (LBW) infants are born in India each year, an incidence of nearly 30 percent—and nearly 40 percent of the global burden—the highest of any country. Three-fourths of neonatal deaths occur in LBW babies, who are at an 11-13 times higher risk of mortality during the neonatal period compared to normal birth weight babies. LBW babies continue to suffer higher morbidity and mortality beyond the neonatal period, and a growing body of evidence from the country suggests that full term LBW babies are at a high risk of developing a variety of adult-onset diseases. The majority of LBW infants in India are full term, with the prematurity rate varying from 11-14 percent. Over 80 percent of LBW babies weigh between 2,000-2,499 gm, and approximately three percent weigh less than 1,500 gm. Community-based studies show that most LBW babies can survive in home settings with simple, low-cost interventions delivered by community health workers.

Neonatal infections (pneumonia, septicemia, meningitis, and diarrhea) are the most common causes of mortality in neonates, accounting for almost half of deaths. Staphylococcus aureus, Klebsiella spp. and Escherichia coli are the three principal organisms of sepsis. The treatment of neonatal sepsis in home-settings with oral cotrimoxazole and intramuscular gentamicin by village health workers has been shown to reduce sepsis associated neonatal deaths by 76 percent (27.5 to 6.6). Sepsis-causing organisms in hospitals show a widespread resistance to commonly used antibiotics.

Asphyxia is the second most common cause of neonatal deaths. From 2-4 percent of babies suffer from significant asphyxia at birth in homes. Studies conducted in the country have shown that resuscitating asphyxiated neonates at birth using room air is as effective as using oxygen. In operations research settings, community-based health workers and traditional birth attendants have demonstrated the effective use of bag-and-mask ventilation for neonatal resuscitation of home-delivered babies.

Newborn Care Practices and Care Seeking

Newborn care practices in India are steeped in its diverse tradition and culture. A newborn is not recognized as a "person," and the death of a newborn is accepted as a common occurrence in most communities. Traditional newborn care practices vary by region, rural and urban settings, religion, caste, ethnicity, and socioeconomic status. Some practices are beneficial (e.g., breastfeeding as a cultural norm), others are harmful (e.g., bathing the baby soon after birth), and yet others are inconsequential (tying on an amulet to ward off "evil eye").

A strong gender bias in care-seeking against female neonates is conspicuous at all levels of the health system in the available facility-based studies; for every two sick newborn boys, only one female neonate is admitted to a facility.

Families often recognize common signs of neonatal illness, but they do not perceive many of them as serious and thus delay seeking care. Families often consult the nearest private provider — in many cases an untrained practitioner—as their first choice of health provider. Families often do not comply with referral advice for a number of practical reasons. Those families with sick neonates who end up in referral institutions often bypass nearby primary care institutions because of their lack of faith in these facilities.

Newborn Health Research and Other Initiatives

Several pioneering studies on community newborn care have been conducted in India, covering such areas as risk-approach strategies in neonatal-perinatal care, the community-based care of LBW infants, treating neonatal pneumonia in the community, home-based newborn care, involving Anganwari workers (AWWs) in newborn care, and managing birth asphyxia and sepsis in community settings. Studies by SEARCH at Gadchiroli have provided insights into how newborn survival interventions can be implemented at the household levels, while ongoing studies supported by the Ministry of Health and Family Welfare, Save the Children/US, and USAID are exploring a range of approaches to community-based newborn care.

The Neonatal Resuscitation Program (NRP), steered by the National Neonatology Forum (NNF), has been a vibrant institution in India since 1990 and is perhaps the most comprehensive NRP in the developing world. The National Neonatal-Perinatal Database network of tertiary and secondary institutions is a unique collaborative initiative with a remarkable potential for multi-center clinical trials, quality improvement programs, and developing standards of facility-based newborn care. In recent years several state governments and institutions have carried out training and other initiatives in neonatal health , often with the technical support of the NNF.

Key Stakeholders and Partners

The NNF of India is the foremost champion and catalyst for newborn health in the country. Eminent members of the NNF, who have collectively laid a strong foundation of neonatology and newborn care in India, have led the way with several projects and innovative approaches to newborn care in several parts of the country. The NNF has been instrumental in placing newborn care very high among the national health priorities through sustained advocacy, coupled with academic contributions and consensus-building in key program areas. The Indian Academy of Pediatrics (IAP), the Federation of Obstetrics and Gynecology (FOGSI), the Indian Society for Perinatology and Reproductive Biology, the Trained Nurses' Association, the Breastfeeding Promotion Network of India, and the White Ribbon Alliance of India all support the cause of newborn health. Save the Children's Saving Newborn Lives initiative is working with partners to facilitate research, to disseminate kangaroo mother care (KMC) as an effective approach to LBW infants, and to promote nursing education and programming. The World Bank, WHO, UNICEF, UNFPA, USAID, and DFID all consider newborn health a high priority area for their respective country programs.

Health Policy and Programs

The National Population Policy (NPP) is the over-arching policy framework for family planning, maternal health, and newborn and child health plans and programs. The NPP calls for the reduction of the infant mortality rate (IMR) to less than 30 per 1,000 live births by the year 2010. Achieving this goal would require reducing the NMR to about 20 per 1,000 live births. The NPP also aims to reduce the MMR to less than 100 by the year 2010. The NPP goals for the year 2010 also include achieving an institutional delivery rate of 80 percent and a rate of 100 percent for deliveries by trained persons. The 10th Five Year Plan aims at achieving an NMR of 26 by 2007 and specifies IMR and NMR targets for all states. India is a signatory to the Millennium Declaration (2000) of the UN and is thereby committed to the Millennium Development Goals.

The health system in India is a mix of the public and private sectors, with the NGO sector playing a small but important role. The public health system consists of subcenters, primary health centers (PHCs), community health centers (CHCs), first referral units (FRUs), and district hospitals. The auxiliary nurse midwife (ANMs) is the most peripheral level service provider (1 each for 5,000-8,000 people); she provides very little newborn care at present. Most PHCs, CHCs and FRUs do not provide optimal care to mothers, neonates, and children.

Studies have demonstrated that traditional birth attendants (TBAs), widely accepted in the community, can be trained to provide many but not all elements of essential newborn care. AWWs who belong to the Integrated Child Development Services (ICDS) are assigned to a population of 1,000 per worker (roughly one village) where their primary focus is nutrition, nonformal education, and assisting ANMs in outreach activities. There is a tremendous potential for AWWs to contribute to community-based newborn care at the home and community levels.

India has a vast, vibrant private health sector, located mostly in urban areas. Over 80 percent of qualified medical doctors are in the private sector, but most villages and periurban slums have unqualified practitioners providing health care of doubtful quality for profit. In recent decades, advanced neonatal intensive care units have been established in teaching and non-teaching hospitals in large cities, while smaller cities and towns have witnessed dramatic growth in newborns nurseries in small private hospitals and nursing homes. In spite of the high cost of neonatal intensive care, it is still more cost effective than adult intensive care services. However, health insurance and risk-pooling systems are virtually nonexistent in India, and the poor, therefore, cannot access care in the private health system.

Nursing personnel forms the backbone of perinatal-neonatal care at first referral units, community health centers, district hospitals, and other institutions. Newborn nursing has not yet emerged as a nursing specialty. Moreover, there is a lack of resource materials and training capacity for nurses, especially those working at district and subdistrict government facilities.

Essential newborn care (ENC) was first introduced nationally in the CSSM program in 1992, and has also been a part of the RCH program since 1997. ENC initiatives consist of strengthening the PHCs, FRUs, and district hospitals, as well as training physicians. Complementary maternal health initiatives consist of antenatal care, promoting institutional deliveries, and operationalizing EmOC at FRUs. The training of TBAs also continues in selected districts.

India has completed its national adaptation of the Integrated Management of Childhood Illness (IMCI) strategy. The Indian version, called the Integrated Management of Neonatal and Childhood Illness (IMNCI), incorporates significant additional elements focused on the newborn. The IMNCI training program starts with the newborn and young infant, and devotes 50 percent of the overall training time to their care. The implementation strategy incorporates home visiting for preventive-promotive care of the newborn. A simpler version of this module exists for the health workers (AWWs, ANMs).

India is currently finalizing plans for the next five-year phase (2005-10) of the RCH program (RCH II). There is a consensus to incorporate a comprehensive maternal and newborn health strategy into RCH II. Promotion of institutional deliveries and strengthening of EmOC are the key strategies to reduce maternal mortality. Under the Janani Suraksha Yojana poor families would receive incentive for institutional deliveries at government facilities, and TBAs will be compensated for facilitating this process. The quality and reach of ANC will be enhanced. Home-based newborn care with the help of AWWs under the supervision of ANMs using IMNCI protocols will be implemented. Interventions will include prevention of hypothermia, early and exclusive breastfeeding, prevention of infections, extra care of LBW infants, early detection and care of some illnesses at community level, and referral for those that cannot be managed locally. In populations where access to skilled birth attendants (SBAs) or institutional deliveries is not available, safe and clean deliveries by TBAs will continue to be supported through training. Facility-based care of neonates will be improved through strengthening of infrastructure, provision of extra nurses, and skills upgradation of physicians and nurses. Fifty percent of all PHCs (n~11000) will be operationalized to provide round-the-clock basic EmOC, and newborn and child care services. About 2000 FRUs will be operationalized for comprehensive EmOC, and more advanced newborn and child services. Nursing staff will be strengthened PHC upwards. Behavior change communication (BCC) strategy will aim at promoting early and complete ANC, institutional deliveries, birth preparedness, recognition and early care-seeking for maternal and neonatal danger signs, healthy household practices.

The Way Forward

India is at the threshold of a neonatal survival revolution, thanks to her abiding policy commitment to newborn health and a promising strategy for maternal and neonatal health in the next phase of the RCH program, well supported by the commitment of the states.

It is time for all the champions and stakeholders of newborn health to join hands to orchestrate a national effort to support the centre and state governments in implementing the program.

The success of the RCH program in reducing India's NMR will require concerted efforts to:

- Ensure greater synergy between the ICDS and the health system and fully involve AWWs in maternal-neonatal care at the household and community levels in rural and urban communities.
- Accelerate efforts to address the unfinished agenda of eliminating neonatal tetanus in the near future.
- Develop sustainable models of obstetric-neonatal services at PHCs, CHCs, FRUs, and district hospitals.
- Scale-up the community-skilled birth attendants' scheme to meet the long-standing need of providing skilled birth attendants in the community.

- Involve Panchayati Raj Institutions (PRIs) in saving newborn lives and prepare advocacy and education materials targeted to PRI leaders.
- Develop a strategy for the urban poor neonate, launching newborn care initiatives in cities through collaboration among the NNF, civic bodies, NGOs, and others.
- Harness the potential of NGOs, including professional bodies, for technical assistance, training, community mobilization, service delivery, and operations research.
- Demonstrate sustainable models of public-private partnerships for newborn care.
- Reach out to other stakeholders to address gender bias against the girl neonate.
- Broaden advocacy efforts to target new potential stakeholders, especially at the state level.
- Establish a partnership of newborn health stakeholders—as a platform for advocacy, strategic deliberations, program support, and experience sharing.

The effort to reduce newborn mortality in the near future would be further facilitated by the following actions:

- Forging an India Breastfeeding Partnership to catalyze a national effort to achieve high rates of exclusive breastfeeding.
- Building capacity for KMC and disseminating this beneficial practice of newborn care in facilities and in communities after adaptation and evaluation.
- Launching an evidence-based newborn care initiative to promote implementation of best newborn care practices by providers and families.
- Developing accreditation criteria and practice guidelines for small newborn units (mini-NICUs) in the private sector.
- Recognizing the newborn patient as a "bed" in hospitals, thereby ensuring a proportional allocation of personnel, supplies, and budget to neonates like other patients.
- Conducting a situational analysis on the state of newborn care infrastructure, facilities, and manpower at teaching institutions in the country and preparing a strategy to strengthen their role in patient care, professional education, program support, and research.
- Improving the pre-service and in-service curricula of physicians, nurses, and ANMs to ensure proficiency in key neonatal care skills.
- Strengthening the capacity for newborn nursing by launching in-service training programs for nurses working at PHCs, CHCs, FRUs and district hospitals.
- Undertaking operations research on key priorities in newborn health, especially in developing models of newborn care at the community level.

Conclusion

Neonatal health is the foundation of child and adult health. A healthy start to life also depends on the health of the mother and the care that she and her baby receive before, at, and after birth. Evidence-based interventions, if taken to scale, can save millions of newborn lives in India in the next few years. Translating knowledge into action is the key to meeting this challenge and realizing the goal. And a resurgent India can do it!

The vision for newborn health in India is ambitious, yet achievable. The time has come to orchestrate a national effort to accomplish the newborn health mission¾a mission to be steered by an alliance of the center and state governments, providers, professionals, academia, civil society, program managers and development partners. This mission will be equity-driven and will strive to remove gender disparity in perinatal-neonatal care.

And this mission will help place India in the category of proud nations with low maternal, newborn, and child mortality by the year 2015.

1 The Challenge of Neonatal-Perinatal Health

Burden of Births and Neonatal Deaths

The newborn health challenge faced by India is more voluminous, more diverse, and more formidable than that of any other country in the world.

India is home to the highest number of births and neonatal deaths in the world (Table 1.1).[1,2]

Each year, 26 million infants are born in India. Of these, 1.2 million die during the neonatal period, before completing four weeks of life. The neonatal mortality rate (NMR) of 44 per 1,000 live births (2000) translates into at least two newborn deaths every minute somewhere in this vast country.[2]

India, thus, contributes nearly 30 percent of the 3.9 million neonatal deaths worldwide (Figure 1.1).[3]

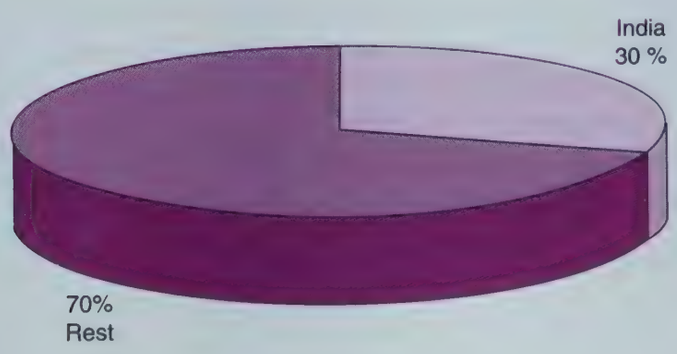
Table 1.1 India's contribution to the global burden of births and neonatal deaths (in 2000)

	Burden	Proportion of global burden*	Rank in world
Live births	26 million	20%	1
Neonatal deaths	1.2 million	30%	1

Based on Sample Registration System[1] and Census 2001[2]; data provided in detail in Annex 1
* Approximate

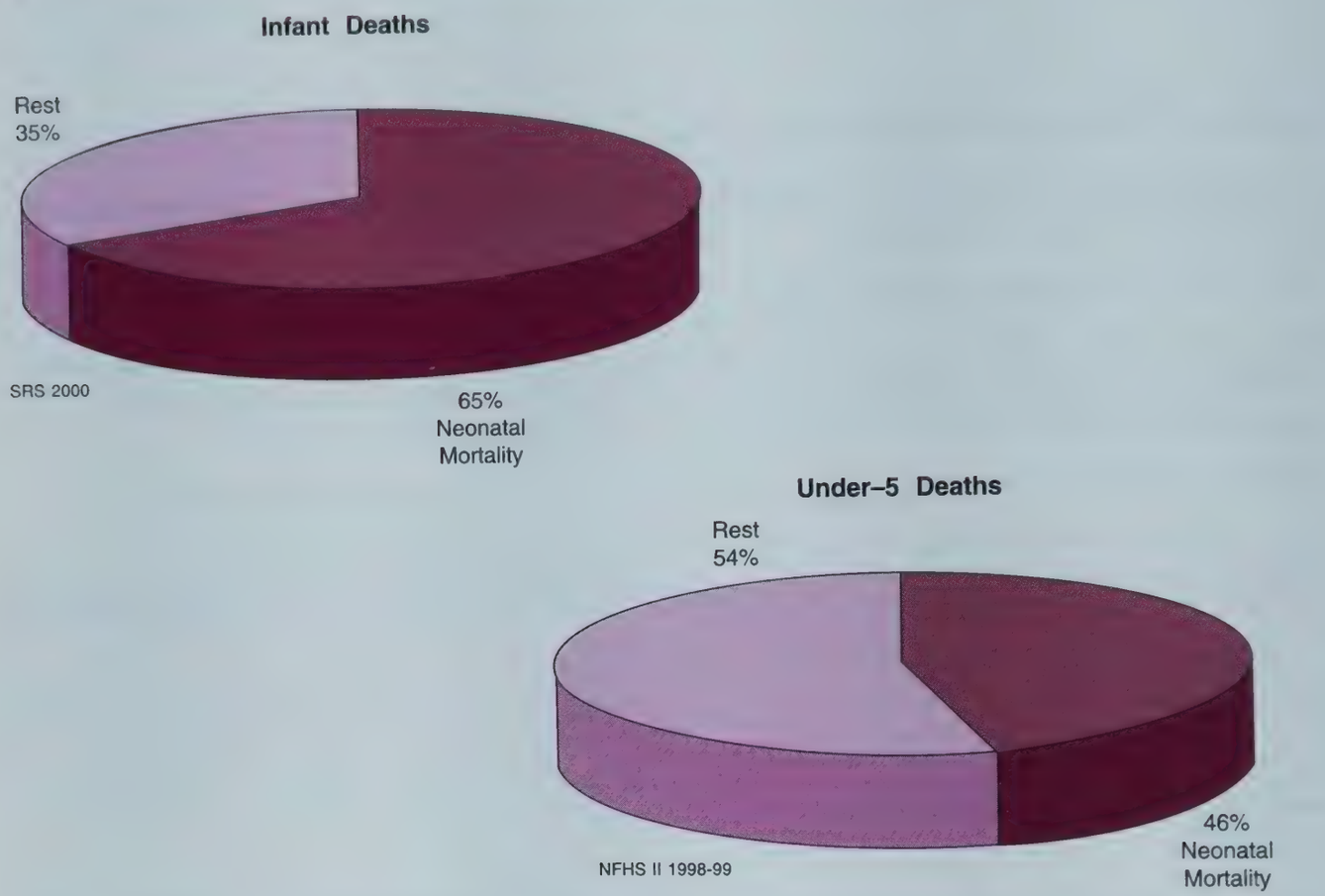
India also harbors the highest number of low birth weight (LBW) infants born each year worldwide: eight million (40 percent) of the total of 20 million LBW babies.[4]

Figure 1.1 India's proportion of the global burden of neonatal deaths



Estimates around the start of the new millennium put India's infant mortality rate (IMR) at 68 per 1,000 live births (2000)[2] and under-5 child mortality rate 95 at per 1,000 live births (1998-99).[5] Hence, nearly two-thirds of infant deaths and about half of under-five childhood deaths occur in the neonatal period (Figure 1.2). Moreover, the *early* neonatal mortality rate (ENMR) in India is 32 per 1,000 live births.[2] This implies that nearly three-fourths of neonatal deaths, half of infant deaths, and one-third of under-five child deaths occur within the first seven days of life.[5]

Figure 1.2 Neonatal deaths as a percentage of infant and under-five deaths



The above figures of newborn deaths, derived from the National Family Health Survey (NFHS)[5] and the Sample Registration System (SRS)[2] may underestimate the magnitude of the problem because many parents are reluctant to reveal the birth of their babies, a practice stemming from a collective memory of the high death rate of newborn infants over generations. Many communities do not assign a name to the infant until she or he has survived a few days or even weeks to avoid embarrassment and guilt in the event of death. A recent study (1998-2000) in 13 community sites in Maharashtra (encompassing a population of 227,000 in 231 villages and 6 urban slums) documented a NMR of 51 per 1,000 live births.[6] This figure was much higher than the 32 and 29 per 1,000 live births reported by NFHS II and SRS, respectively, for the state. This study confirmed the problem of an additional burden of hidden newborn deaths in the country.

Neonatal Mortality in Different States

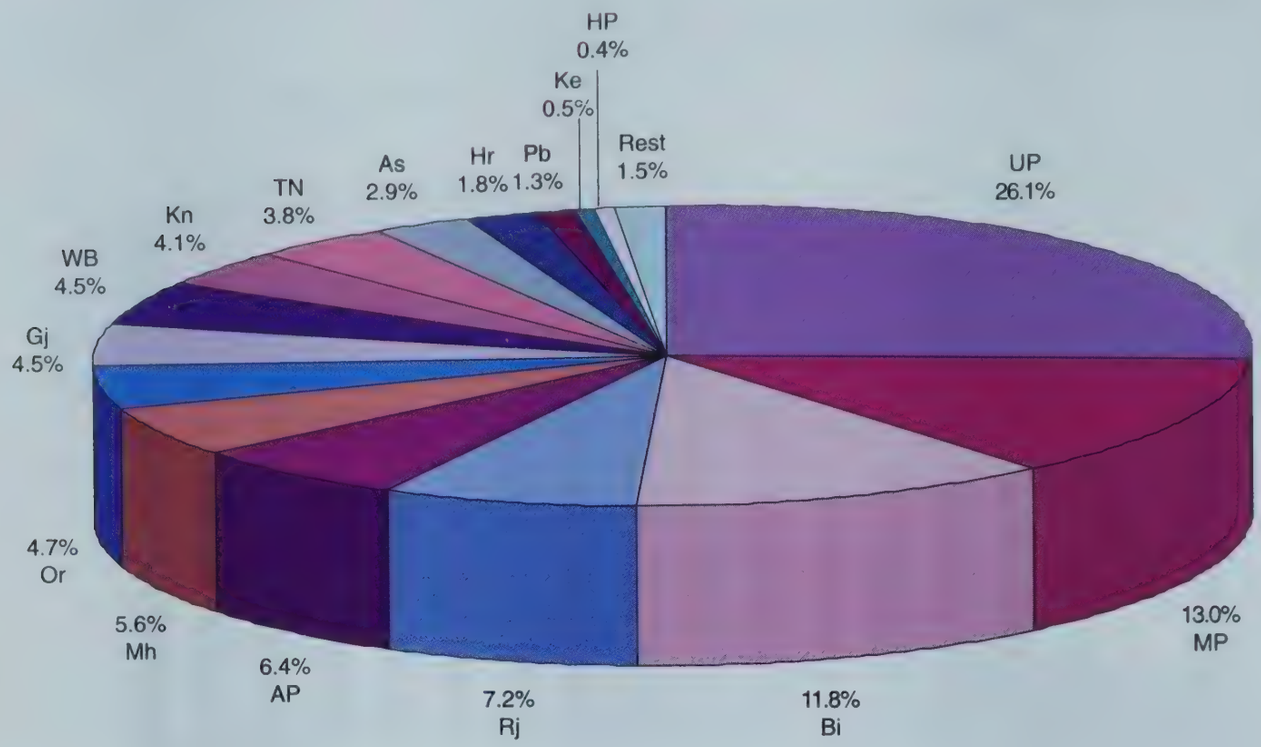
India is an immense country with a wide range of neonatal mortality rates in different states, from as low as 10 per 1,000 live births in Kerala to around 60 in Orissa and Madhya Pradesh (Figure 1.3).[1] ENMR and late neonatal mortality rates (LNMR) together make up the NMR.

Figure 1.3 Neonatal mortality rates by state

Ke: Kerala; Pb: Punjab; WB: West Bengal; HP: Himachal Pradesh; Mh: Maharashtra; TN: Tamil Nadu ; Hr: Haryana; Kn: Karnataka; Bi: Bihar; Gj: Gujarat; AP: Andhra Pradesh; As: Assam; Rj: Rajasthan; UP: Uttar Pradesh; MP: Madhya Pradesh; Or: Orissa

The highest burden of neonatal deaths occurs in Uttar Pradesh, Madhya Pradesh, and Bihar, which together account for 50 percent of all newborn deaths in the country (Figure 1.4) — or 15 percent of the *global* burden of neonatal mortality.

Figure 1.4 The burden of neonatal deaths in major states



Estimates based on data from the National Human Development Report 2001[7] & SRS 2000[1] as summarized in Annex 4

UP: Uttar Pradesh; MP: Madhya Pradesh; Bi: Bihar; Rj: Rajasthan; Mh: Maharashtra; Or: Orissa; Gj: Gujarat; WB: West Bengal; Kn: Karnataka; TN: Tamil Nadu; As: Assam; Hr: Haryana; Pb: Punjab; Ke: Kerala; HP: Himachal Pradesh

[N.B.: The data of UP, MP, and Bi in this figure refer to the year 2000 before these states were divided. Three new states of Uttaranchal, Chhattisgarh and Jharkhand were carved out of UP, MP and Bi, respectively. Population and IMR (per 1000 live births) of the present states are as follows: UP: population 166.1 million, IMR 80; Uttaranchal: population 8.5 million, IMR 44; MP: population 60.4 million, IMR 85; Chhattisgarh: population 20.8 million, IMR 73; Bihar: population 82.9 million, IMR 61; and Jharkhand: population 26.9 million, IMR 58. The NMR estimates after reorganization of these states are not available as yet. The newly created states represent a smaller fraction of the original states, with lower or similar IMR. Thus, even the present, truncated UP, MP, and Bihar continue to carry the highest burden of infant mortality, and therefore, by implication, neonatal mortality. (Data on population and IMR provided in this note are taken from Census 2001[2] and SRS 2002[8], respectively.)]

Trends in Neonatal Mortality

India has seen a substantial reduction in IMR and NMR in recent decades (Figure 1.5). Since the early 1970s, the IMR declined from 140 per 1,000 live births to 64 (in 2002). The NMR has declined from 72 per 1,000 live births in 1972 to 44 in 2000 – a reduction of almost 40 percent. The reduction in NMR is probably due to three possible reasons: (1) a major decline in neonatal tetanus (NNT) due to a successful maternal tetanus toxoid (TT) immunization program, (2) a gradual increase in institutional deliveries and skilled attendance, and (3) birth spacing leading to indirect benefits for neonatal survival.

The enormous ongoing toll of newborn deaths is all the more poignant and disturbing in light of the slowing momentum of the NMR decline (Figure 1.6). Compared to a 25 percent reduction in the NMR in the 1980s, the decline in the 1990s was only 15 percent. Between 1995 and 2000, there was only a negligible decrease of four points, from 48 to 44 per 1,000 live births. This tapering off in the rate of decline is a cause for serious concern for the government and other stakeholders.

Figure 1.5 Trends in infant mortality rate, neonatal mortality rate, and post-neonatal mortality rate

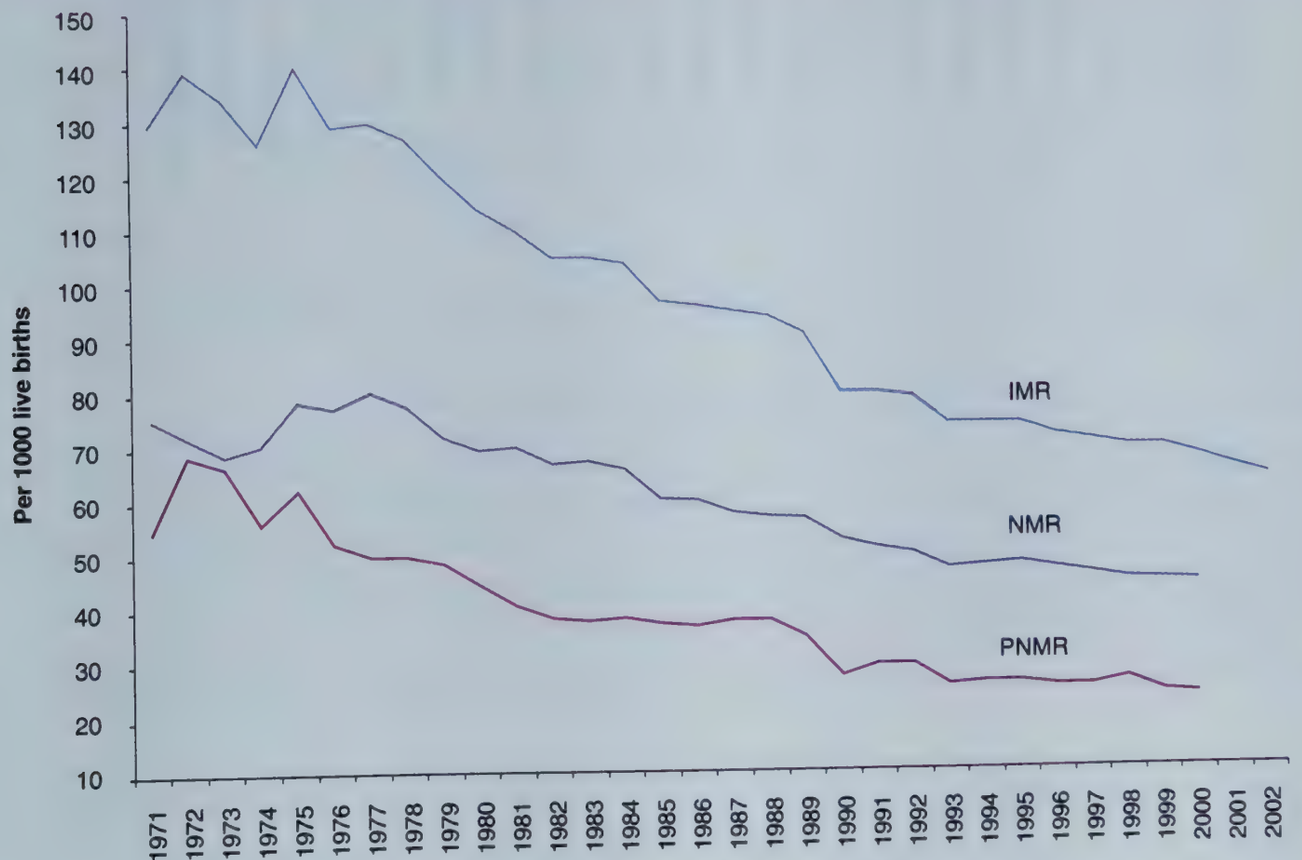
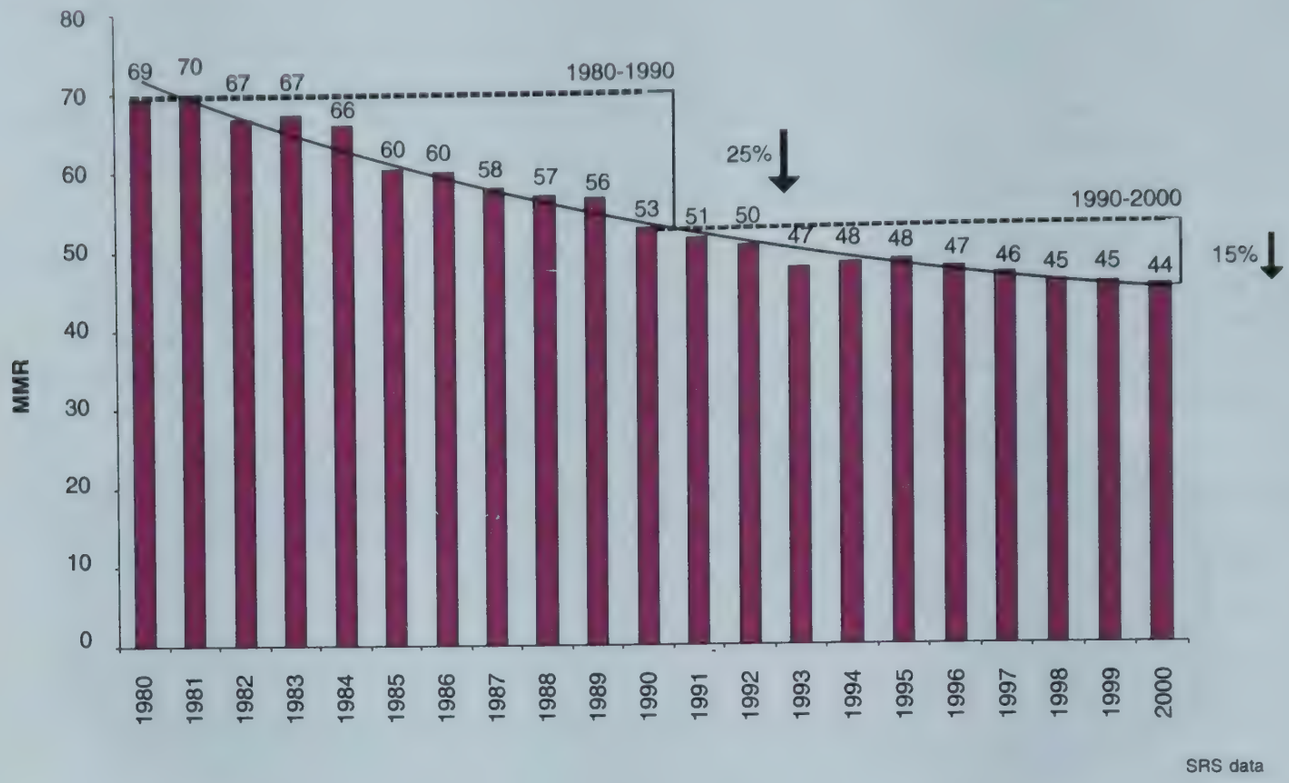


Figure 1.6 Recent trends in the neonatal mortality rate

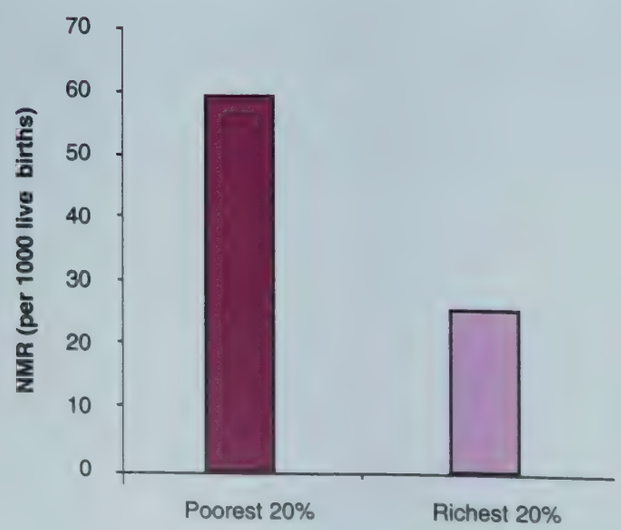


It is ironic that there are perhaps more newborn deaths today than at the time of independence in 1947.

Rural-Urban, Poor-Rich Differences in Neonatal Mortality

There are important rural-urban and socio-economic differences in the NMR. The NMR in rural areas is one and a half times that in urban areas, or 51.7 (per 1,000 live births) compared to 33.5 in the urban population.[5] Neonatal deaths are the bane of the poorest; an analysis of the NFHS II data shows that in India, the NMR among the poorest 20 percent of the population is more than double the NMR of the richest 20 percent – 60 versus 26 per 1,000 live births. (Figure 1.7) [9]

Figure 1.7 Neonatal mortality rates among the poorest and richest 20 percent of the population



Skilled Attendance and Institutional Deliveries

In India, SBAs conducted only 42.3 percent of deliveries in 1998-99. (Table 1.3) [5] Compared to the preceding five years, this rate had increased by eight percent, largely due to a 50 percent increase in the coverage by doctors. Traditional birth attendants (TBAs) continue to conduct over one-third of all deliveries. As expected (Table 1.2), skilled attendance rates are low in rural areas (33.5 percent), among the poor (25.4 percent), and among illiterate women (25.4 percent).

In 1989-99, only 33.6 percent of births occurred in health facilities/institutions according to the NFHS II.[5] The increase from the 25.5 percent rate estimated in NFHS I (1992-93)[10] was essentially due to an increase in deliveries in private institutions from 10.9 percent to 16.7 percent. There was only a negligible increase in deliveries in government institutions (Table 1.3). Almost 75 percent of deliveries in rural areas continue to occur in the home, and over 80 percent of births among illiterate women or those with a low standard of living index took place at home in 1998-99.[5]

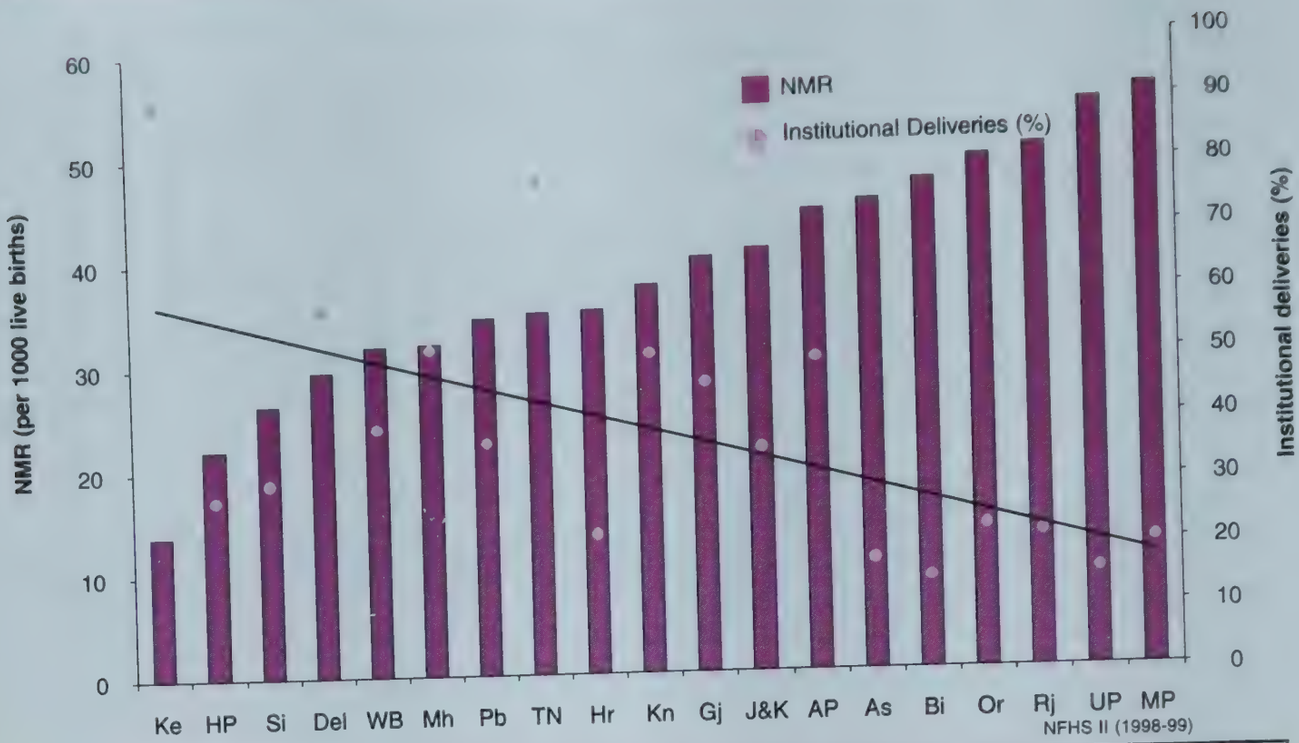
Table 1.2 Trends in place of birth and assistance during delivery[5,10] *

	1992-93(NFHS I)	1998-99(NFHS II)
Place		
Home	73.5	65.4
Health facility/institution	25.5	33.6
Public	14.6	16.2
Private	10.9	16.7
NGO	–	0.7
Other missing	0.5	1.0
Assistance		
TBA	35.2	35.0
Skilled attendant	34.2	42.3
Doctor	21.6	30.3
ANM/nurse/midwife/LHV	12.6	11.4
Other health professional	–	0.6
Other person	29.5	22.4
Missing/none	1.1	0.3

* All values are percentages

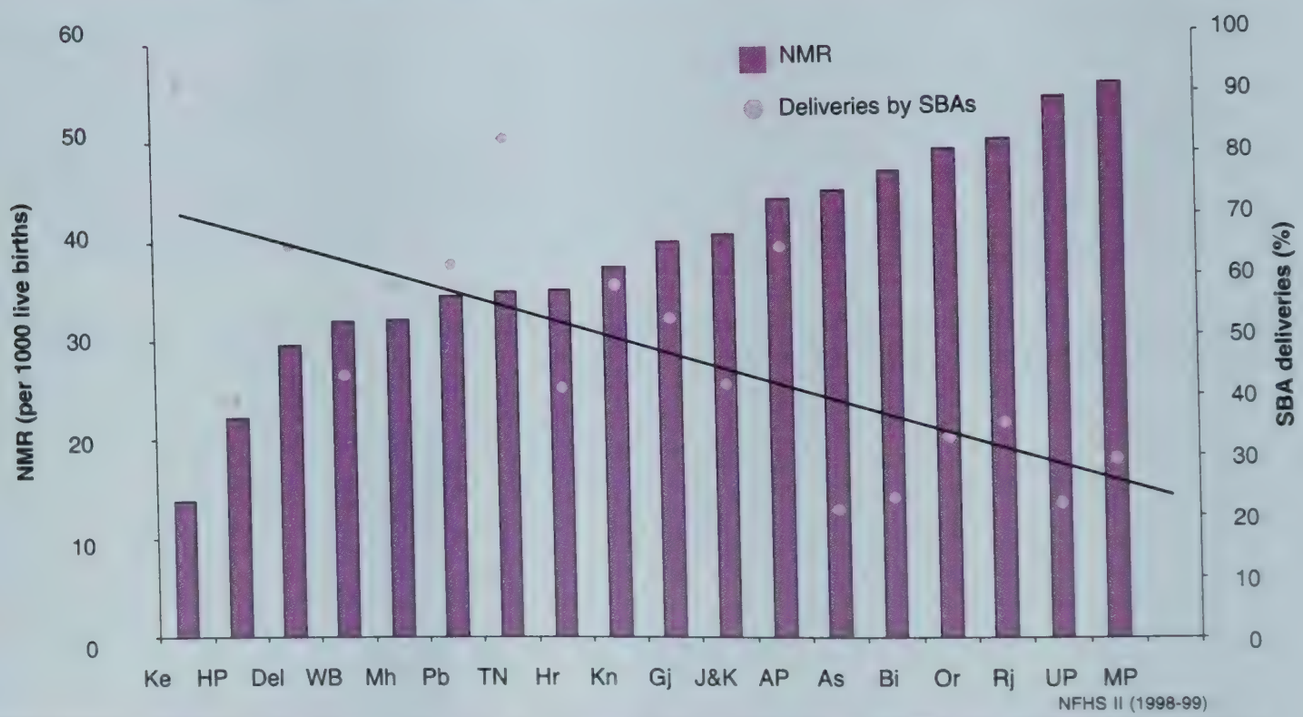
The distribution of skilled attendance and institutional deliveries by states reveals an inverse bivariate (Figures 1.8 and 1.9) relationship with NMR.[5]

Figure 1.8 Neonatal mortality rate and institutional deliveries by state



Ke: Kerala; HP: Himachal Pradesh; Si: Sikkim; Del: Delhi; WB: West Bengal; Mh: Maharashtra; Pb: Punjab; TN: Tamil Nadu; Hr: Haryana; Kn: Karnataka; Gj: Gujarat; J&K: Jammu and Kashmir; AP: Andhra Pradesh; As: Assam; Bi: Bihar; Or: Orissa; Rj: Rajasthan; UP: Uttar Pradesh; MP: Madhya Pradesh

Figure 1.9 Neonatal mortality rate and deliveries by skilled birth attendants by state

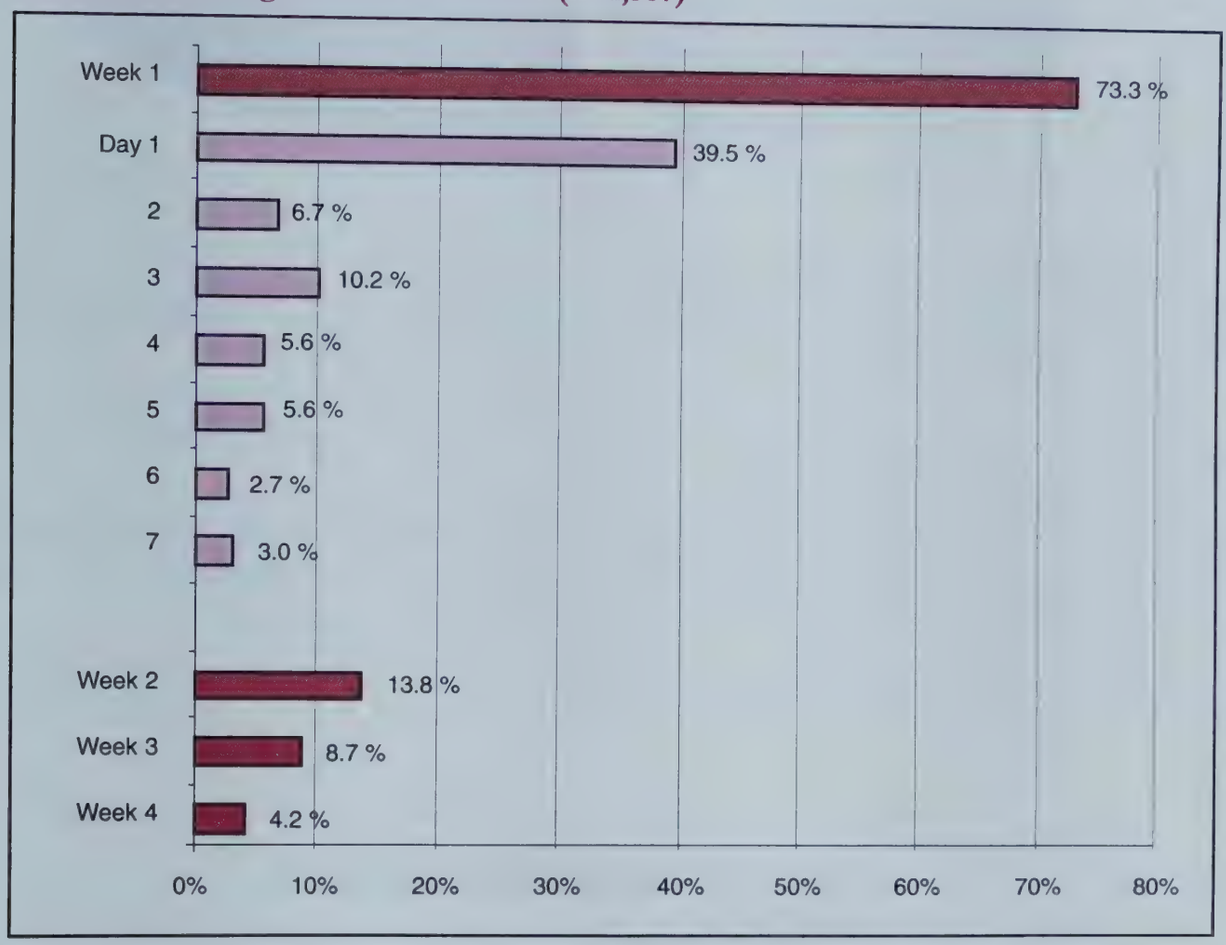


Ke: Kerala; HP: Himachal Pradesh; Del: Delhi; WB: West Bengal; Mh: Maharashtra; Pb: Punjab; TN: Tamil Nadu; Hr: Haryana; Kn: Karnataka; Gj: Gujarat; J&K: Jammu and Kashmir; AP: Andhra Pradesh; As: Assam; Bi: Bihar; Or: Orissa; Rj: Rajasthan; UP: Uttar Pradesh; MP: Madhya Pradesh

When Do Neonates Die?

Provisional data from the baseline survey of the five-site Indian Council of Medical Research (ICMR) study (in rural Bihar, Uttar Pradesh, Maharashtra, Rajasthan, and Orissa) on "Home-based management of newborn and young infants" provides interesting insights into the timeline of neonatal deaths in the community (Figure 1.10).[11] Of the 1,387 neonatal deaths, 39.5 percent (n=548) occurred on day one and 56.4 percent (n=783) occurred within the first three days of life. As in the SRS data,[6] almost three-fourths of all deaths occurred within the first week.

Figure 1.10 Timing of neonatal deaths (n=1,387)



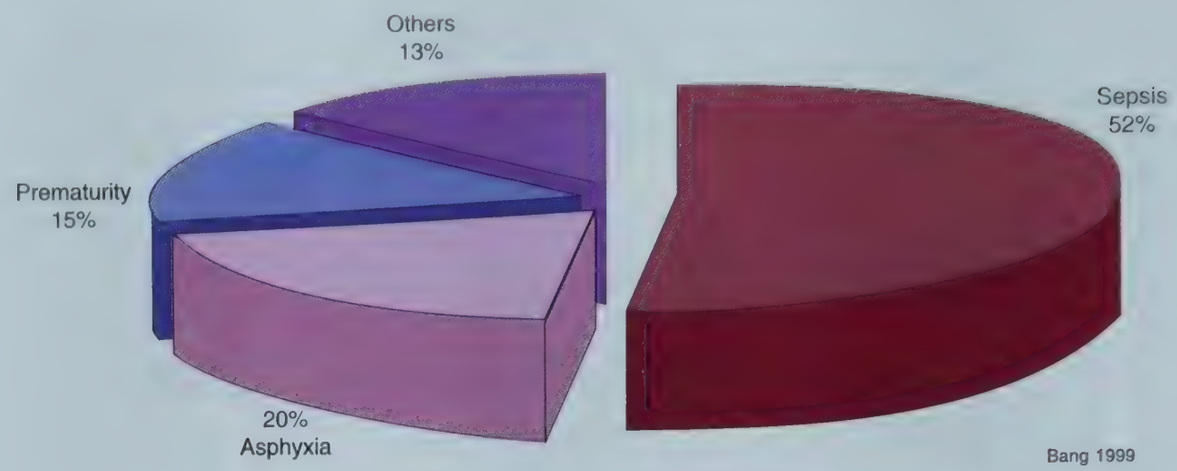
Based on provisional data from the baseline survey of the 5-site ICMR study on "Home-based management of young infants"[11]

Causes of Neonatal Death

The most complete study on the causes of neonatal death was conducted by the Society for Education, Action and Research in Community Health (SEARCH) in Gadchiroli (Maharashtra). Specially trained village health workers (VHWs) examined neonates by visiting them at home on eight or more occasions during the first four weeks. The workers meticulously recorded history and examination findings at birth and on subsequent visits. A neonatologist evaluated the detailed notes on the 40 infants who died in the neonatal period and assigned the primary cause of death (Figure 1.11).

Neonatal sepsis (NNS), including septicemia and pneumonia, emerged as the most common cause, figuring in 52 percent of the deaths, followed by birth asphyxia (20 percent), and prematurity (15 percent). This profile presents the primary causes of neonatal deaths in an area of high neonatal mortality (51 per 1,000 live births) a poor rural population, where tetanus deaths were no longer a problem.[12]

Figure 1.11 Primary causes of neonatal death (n=40)

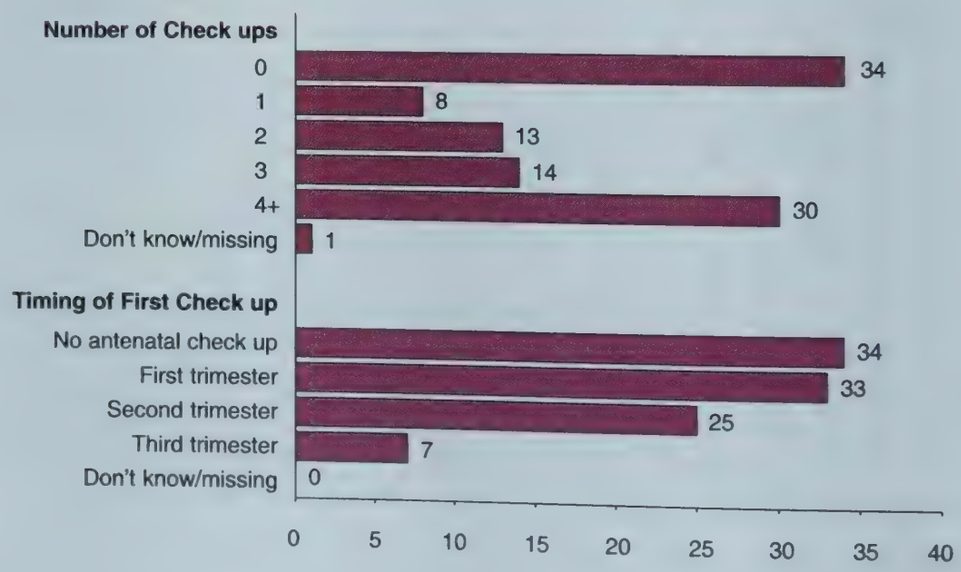


NNT was responsible for 350,000 deaths or 25-33 percent of total deaths in the early 1980s.[13] The World Health Organization (WHO) estimates that India led the world in NNTdeaths in 1999, with 23 percent (n=48,600) of the 215,000 deaths worldwide.[14] NNT is thought to be localized in small pockets of remote parts of the country.

Antenatal and Postpartum Care

According to NFHS II, only 65.4 percent of pregnant women received at least one antenatal checkup.[5] Only 43.8 percent of women received the recommended three or more check ups, (Figure 1.12), and only one third of pregnant mothers were examined in the first trimester.

Figure 1.12 Antenatal check ups of pregnant women



By state, there are large variations in ANC coverage. Over 90 percent of women received one or more check ups in Kerala, Tamil Nadu, and Andhra Pradesh but the figures for check ups dropped to only 36.3 percent in Bihar and 34.6 percent in Uttar Pradesh.[5]

Almost a quarter (24.1 percent) of pregnant women did not receive any tetanus toxoid (TT) immunization.[5] Two or more doses of TT, recommended as an essential component of antenatal care (ANC), were delivered to 66.8 percent of women.[5] This implies that potentially eight to nine million pregnancies in India are at risk of complications from maternal-NNTeach year.

The frequency of postpartum check ups was very poor; only 17 percent of the non-institutionally delivered women received a postpartum check up, and of those women, only 14 percent were seen within two days of delivery; 31 percent were seen within the first week.[5]

Women's Status, Age, and Birth Spacing

The sex ratio at birth in India is 933 females for 1,000 males, a serious gender distortion with profound demographic, health, and social implications.[2]

India is ranked 102nd in the world by the gender-related development index (GDI).[15] The female economic activity rate (age 15 and above) is 42.2 percent, which is half of the male rate. Of women in the 15-49 age group, 50.8 percent are literate, with 44.4 percent having completed primary education.[5] The median age at marriage among 20-49 year-old women surveyed in NFHS II was just 16.7 years. The median age at first birth among 25-29 year- old women was 19.6 years.[3]

NFHS II reported the average age at first birth among 25-29 year-old women as 19.6 years.[5] NMR was in mothers under 20 years of age at delivery (63 per 1,000 live births) was almost one and a half times that of mothers who were 20-29 years old (41 per 1,000 live births).

Birth spacing reduces the risk of neonatal mortality. NFHS II data shows that NMR was 50 percent less if the birth interval was 2-4 years compared to that if the interval was less than two years (36 and 71 per 1,000 live births, respectively).[5]

The Challenge of Newborn Health Among the Urban Poor

Of the one billion people in India, 28 percent live in cities. The annual growth rate of the urban population is 3.1 percent (vs. 1.9 percent for the overall population). As a result, by the year 2015 the number of urban dwellers will grow to 35 percent. It is estimated that 30 percent of urban dwellers are poor, with urban poverty amounting to 25 percent of the total poverty in India. Recent data suggest that poverty in urban India (26.6 percent) has now exceeded that in the rural areas of India (11.1 percent).[1] Of the 285.4 million urban inhabitants, 61.8 million live in slums, about 28 million of whom (17.5 percent) are concentrated in six mega-cities.

The overall low rates of infant and neonatal mortality in the urban population mask the gross poor-rich disparities. These inequities are more acute than those seen in villages (Table 1.3); the urban poor have almost double the NMR of the urban rich.

Table 1.3 Health indicators and poverty by urban-rural residence (NFHS II)[5]

Indicator	Urban		Rural	
	Low standard of living index	High standard of living index	Low standard of living index	High standard of living index
Infant mortality rate (per 1,000 live births)	76.1	33.0	90.2	52.1
Neonatal mortality rate (per 1,000 live births)	48.8	24.1	56.5	37.4

Unlike the rural areas, cities and towns do not have a well-structured health system. Urban areas are usually catered to by a mix of services, consisting of small and large hospitals complemented by outreach services run by the government, civic agencies, private organizations, and nongovernmental organizations (NGOs). Thus, there is a whole range of providers, including specialists, general physicians, paramedical workers, practitioners of Indian systems of medicine, TBAs, health workers, and untrained registered medical practitioners. Most slum populations are covered by the Integrated Child Development Services (ICDS) scheme. Some metropolitan cities have been implementing World Bank-funded India Population Projects.

Despite a plethora of institutions, one-third of births in the urban population continue to occur in home settings (NFHS II).[5]

Improvements in newborn health could be built more easily on the strengths of the urban systems, such as transportation, exposure to media, proximity to health institutions, and the availability of the rich and resourceful. There is a paucity of operational research in newborn health delivery among the urban poor populations. Ongoing studies by SEARCH, IndiaCLEN, and EHP/USAID will hopefully fill this critical gap and pave the way for formulating effective newborn health strategies for urban settings in India.

Stillbirths and Perinatal Mortality

Stillbirth refers to a fetal death beyond the gestation of viability. WHO defines stillbirth as complete expulsion of the product of conception after 22 weeks of gestation which does not show any signs of life, such as a heartbeat, pulsations of the umbilical cord, respiratory effort, or definite movement of voluntary muscles.[13] Perinatal mortality encompasses both stillbirths plus early neonatal deaths (within the first seven days of life).

Burden of stillbirths and perinatal mortality

Community-based Data

The SRS country estimates of still birth rate (SBR) and perinatal mortality rate (PMR) for the year 2000 are 8 and 40 per 1,000 births, respectively,[2] but these rates are almost certainly underestimating the extent of the problem. In the Maharashtra study at 13 sites, the SBR was 32.1 and PMR 67.7 per 1,000 births.[6] Other community-based prospective cohort studies on stillbirths and perinatal mortality in India summarized in Table 1.4 also show a much higher range of SBR and PMR.

Table 1.4 Community-based prospective studies on stillbirths and perinatal mortality

Author (year)	Setting	SBR (Per 1000 births)	PMR (Per 1000 births)
Bang[6] 2002	13 rural and urban slum sites in Maharashtra; 9,688 births	32.1	67.7
Sachar[18] 2000	Rural community of Ludhiana; 2424 pregnancies	30.9	34.6
Bang[12] 1999	Villages in Gadchiroli; 2,065 births	32.0	68.3
Chandrashekhar[19] 1998	Rural district of south India; 13,214 births	27.0	44.7
Kapoor[20] 1996	25 anganwari centers in urban slums of Lucknow, with 966 births	37.2	59.0
Mishra[21] 1993	PHC of rural community in Lucknow; population 30,000	26.1	121.1
Bhargava[22] 1991	3 urban slums and 3 rural areas; 6914 births	27.0	57.7
Thora [23] 1986	Slums of Jabalpur; population 13,054	30.7*	88.5
Shah[24] 1984	Villages in Sirur, Pune; 3,173 births	28.4	-
Mohapatra[25] 1984	In interior of Orissa; 308 births	45.0	80.4
Damodar[26] 1983	Rural health center in Udaipur; 593 births	24.2	74.2
Datta Banik[27] 1975	Urban community in Delhi; 1,925 births	51.9	74.7

* Not mentioned whether stillbirth and PNM reported as per 1000 birth or live births;
** Per 1000 live births

Based on the above data, it may be reasonable to state that the SBR in India is around 30-35 per 1,000 births whereas the PMR is around 60-70 per 1,000 births. This implies that there are approximately 0.8 million stillbirths and 1.7 million perinatal deaths annually, the highest for any nation in the world.

Hospital-based Data

In a large multicenter study from 15 major centers in 2000, out of 48,497 births, 1,941 were stillbirths and 3,095 were perinatal deaths. The SBR and PMR were 41.7 per 1,000 births and 66.5 per 1,000 births, respectively.[28] The SBR was calculated among all births after more than 22 weeks or a birth weight less than 500 grams. The majority of stillbirths were pre-term (74.3 percent, n=1,081) or LBW (74.9 percent; n=1,454), and nearly half (47.4 percent; n=921) were small for dates.

Causes and maternal risk factors of stillbirths

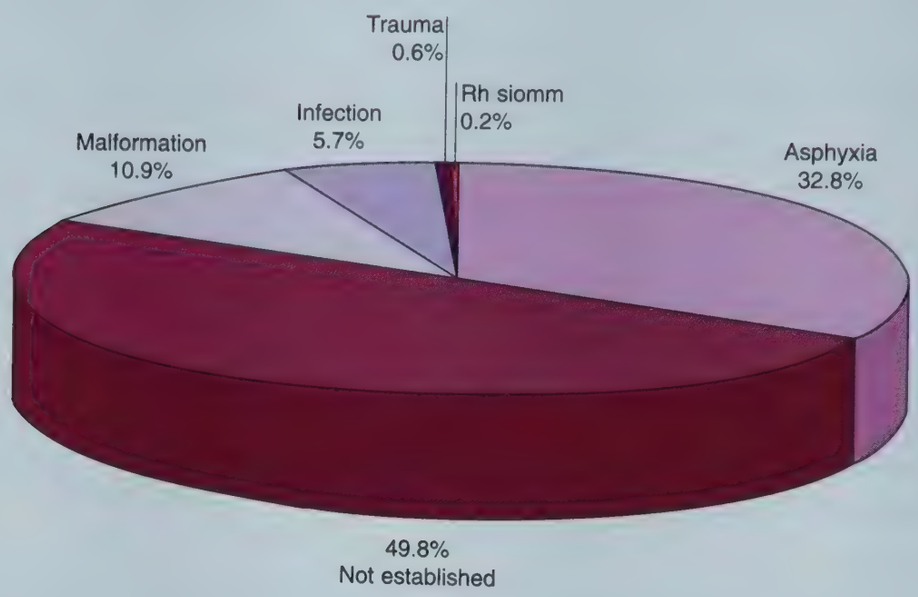
Of the 90 stillbirths reported by Shah et al.,[24] perinatal asphyxia (PA) was the most common cause, accounting for 48 (53.3 percent), with prematurity (15.6 percent) and congenital malformations (4.4 percent) as two other important causes. In 16 cases (17.8 percent), no cause could be ascertained. The risk factors for stillbirth were: no antenatal check ups, untrained birth attendant in abnormal labor, previous stillbirth, abnormal (non-vertex) presentation, and the lack resuscitation skills on the part of birth attendants.

Damodar et al.[26] reported that important risk factors for stillbirths were: lack of ANC, birth weight below 2000 grams, and maternal age below 20 or above 35 years. Kapoor et al.[20] found PA to be responsible for 55.5 percent of stillbirths, while in 36.1 percent of cases no cause could be found. Maternal risk factors for perinatal mortality were: low socio-economic status (odds ratio, OR=1.87), bad obstetric history (OR=2.18), prematurity (OR=1.95), inadequate ANC (OR=1.81), and extremes of maternal age and parity. The study by

Mohapatra[25] from Orissa reported similar risk factors: no ANC, abnormal (non-vertex) presentation, previous stillbirth, presence of maternal problems such as anemia, pregnancy-induced hypertension, and extremes of maternal age (<20 years and >34 years).

0As studies on causes of stillbirths are not easy to perform in the community, it is pertinent to examine hospital-based data. In the 2000 National Neonatal-Perinatal Database (NNPD) study encompassing 1,941 stillbirths, PA was the single most important cause of stillbirth, accounting for 32.8 percent of cases, followed by congenital malformations in 10.9 percent and infections in 5.7 percent (Figure 1.13).[28] No cause could be assigned in half of the cases. Macerated stillbirths accounted for 788 (40.6 percent) of the 1,941 stillbirths.

Figure 1.13 Causes of stillbirths (n=1,941) at 15 centers of the hospital-based National Neonatal-Perinatal Database network [24]



Burden of Neonatal Morbidities

Mortality is just the tip of the iceberg, the bulk of which is comprised of the more pervasive problems associated with morbidities. The SEARCH study provides insight into the burden of neonatal morbidities in poor rural communities, as summarized in Table 1.5.[29]

Table 1.5 Incidence of morbidities in neonates in the community (n=763)[29]

Morbidity	Incidence
Breastfeeding problems	25.6%
Baby unable to suck	*8.8%*
Both baby and mother have problems with breastfeeding	*7.5%*
Delayed breastfeeding	*9.3%*
Umbilical sepsis	19.8%
Neonatal sepsis/ pneumonia (clinical)	18.0%
Hypothermia	17.0%
Skin infections	12.4%
Conjunctivitis	12.3%
Prematurity	9.8%
Birth weight < 2,000g	9.7%
Birth asphyxia	6.2%
Diarrhea	5.5%
Jaundice	2.2%
Abnormal jaundice	1.7%
Hemorrhage	1.4%
Congenital malformation	1.3%

Of 763 neonates, 48 percent suffered from high-risk morbidities (case fatality rate of >10 percent), and 72 percent experienced low-risk morbidities (case fatality rate of 10 percent or lower).[1] Though 54.4 percent of neonates had indications of health care, only 2.6 percent received medical attention. With an NMR estimate of 52 per 1,000 live births (5.2 percent), it was evident that high-risk morbidities were at least 10 times as prevalent, and low-risk morbidities almost 14 times as prevalent as mortality.

2 The State of Maternal Health

Levels and Trends of Maternal Mortality and Burden of Disease

Maternal death is defined as the death of women while pregnant or within 42 days of the termination of pregnancy from any cause related to or aggravated by pregnancy or its management. The maternal mortality ratio (MMR) is the number of maternal deaths per 100,000 live births in one year. Reliable estimates of maternal mortality in India are not available, but some efforts have been made to assess levels of maternal mortality using surveys, special studies, or indirect estimation. Estimates of MMR have varied between about 400-500 per 100,000 live births. Table 2.1 shows various estimates of MMR for India. The most widely quoted figures are 407 (1998) from the SRS and 540 (1998-99) from the NFHS II (1998-99).

WHO's estimates for 2000 show that out of the 529,000 maternal deaths globally each year, 136,000 (25.7 percent) are contributed by India.[1] This is the highest burden for any single country in the world.

Table 2.1 Estimates of MMR from various studies

Source	Year for which estimate is made	Methodology	Sample size (maternal deaths)	National/ region	Estimates of MMR per live 100,000 births	95% CI limits	Remarks
Bhat[2]	1982-86	Model-based estimate from sex differentials of adult mortality	NA	National	580	-	-
Bhat[3]	1992-94	Sisterhood method	NA	National	544	-	-
Bhatia[4]	1984-85	Special study	262	Anathapur district, Andhra Pradesh	830	-	Rural remote district
Kumar[5]	1986	Special study	55	North India Rural areas	230	-	Small study in low mortality area
Bhat[3]	1987-91	Model-based estimate from sex differentials of adult mortality	NA	National	519	-	-
RGI[6]	1993	SRS	384	National	356	-	-
NFHS I[7]	1992-93	Sample survey		National R:448 U:397	437	334-540	Survey not focused on MMR and hence may under- estimate it
Bhat[3]	1991-96	Model-based estimate from sex differentials of adult mortality		National	440	-	-
RGI[8]	1997	SRS	577	National	408	-	Estimates for two states are very low
RGI[9]	1998	SRS	498	National	407	351-463	Estimates for two states are very low
NFHS II[10]	1998-99	Sample survey		National R:619	540 653 U:267	428-	Survey not focused on MMR and hence may underestimate it

R=Rural; U=Urban; CI=Confidence interval; NA=Not available

There are variations in maternal mortality by region and state. The indirect estimates reported by Bhat[3] show that MMR is higher in eastern and central regions, and is lower in the northwestern and southern regions. Data collected under the SRS by the Registrar General of India (RGI) in 1997 paint a similar picture.[6] Table 2.2 gives state-by-state MMR estimates from various studies. It may, however, be noted that the population samples covered by SRS surveys[8,9] are not robust enough for a precise estimate of state-specific MMRs. For the same reason, there is, at times, a large variation in the MMR estimates from the same state between different studies conducted around the same time.

Table 2.2 Regional variation of MMR per 100,000 live births

States	RGI[8] 1997	RGI[9] 1998	Bhat*[2] 1982-86	Bhat*[3] 1994	IIHFW†[11] 1998-99
Punjab	196	199	346	289	351
Haryana	105	103			468
Uttar Pradesh	707	707	879	612	737
Bihar	451	452			714
Rajasthan	677	670	614	588	526
Madhya Pradesh	498	498			601
Orissa	361	367			552
Assam	401	409	709	636	762
West Bengal	264	266			451
Maharashtra	135	135	414	471	365
Gujarat	29	28			393
Andhra Pradesh	154	159	379	383	341
Karnataka	195	195			364
Tamil Nadu	76	79			284
Kerala	195	198			262
India	408	407	580	544	466

* Regional estimates covering more than one state based on rural households; † estimates of MMR from a regression model based on NFHS II data; IIHFW=Indian Institute of Health and Family Welfare, Hyderabad.

Socio-economic variations in maternal mortality are known but not well-documented in India. A study by Bhat et al.[3] shows that generally MMR is higher in scheduled caste and tribe communities and among those living in less developed villages. Variations due to income are somewhat inconsistent, with the expectation that the poor will have higher mortality (Table 2.3).

Table 2.3 Socio-economic variation in the MMR[3]

Background characteristics	Subcategories	MMR (per 100,000 live births)
Caste	Scheduled castes	584
	Scheduled tribes	652
	Others	516
Religion	Hindu	573
	Muslim	384
	Others	428
Education	Illiterate	574
	Primary or less	492
	Middle or more	484
Socio-economic status	Poor	555
	Lower middle	439
	Upper middle	611
	Non-poor	484
Village development	Low	646
	Medium	501
	High	488

Because there are no precise estimates of maternal mortality, it is difficult to say with certainty that maternal mortality has gone down over time, but indirect estimates by Bhat[3] show that there is a gradual decline in the MMR. However, direct measurements (RGI and NFHS) are inconsistent and do not show any decline in recent decades. NFHS shows that in urban areas the estimate of the MMR has gone down, but in rural areas it seems to have increased substantially, even though the difference may not be statistically significant (Table 2.4).

Table 2.4 Estimates of MMR over time

Source	Time period	MMR (Per 100,000 live births)
Bhat[3]	1982-86	580
	1987-91	519
	1992-96	440
RGI[6,8,9]	1993	356
	1997	408
	1998	407
NFHS[7, 10]	1992-93	424 (urban: 397, rural: 448)
	1998-99	540 (urban: 267, rural: 619)

Burden of Disease Due to Maternal Death and Disability

Burden of disease estimates made for 1990 show that worldwide India accounts for 25 percent of maternal deaths as well as disability-adjusted life years (DALYs) lost related to maternal conditions.[12] China, meanwhile, despite its larger population accounts for a much smaller total burden of maternal death and

disability. Together, India and sub-Saharan Africa account for about 65 percent of the global burden of maternal deaths and 56 percent of DALYs lost (Table 2.5).

Table 2.5 Distribution of maternal deaths and DALYs lost due to maternal conditions by region[12]

Region	Maternal deaths, 1990 (thousands)	Maternal deaths as percentage of world	DALYs lost due to maternal deaths, 1990 (thousands)	DALYs as percentage of world
Established market economies	1	0.22	330	1.11
Formerly socialist economies of Europe	2	0.44	565	1.89
India	**115**	**25.33**	**7409**	**24.84**
China	30	6.61	2621	8.79
Other Asia and Islands	52	11.45	4040	13.54
Sub-Saharan Africa	186	40.97	9513	31.89
Latin America and the Caribbean	19	4.19	1703	5.71
Middle Eastern Crescent	48	10.57	3646	12.22
World	**454**	**100.00**	**29827**	**100.00**

Causes of Maternal Deaths

The most common causes of maternal deaths globally are hemorrhage (antepartum or postpartum), eclampsia, pre-eclampsia, infection, obstructed labor, and complications of abortion.[13] The studies of causes of maternal mortality in India by and large show similar results (Table 2.6).[4,6] One difference is the large proportion of maternal deaths attributed to anemia, which is not reported by other countries.[6] The study by Bhatia[4] shows many more deaths due to sepsis and a lower proportion of deaths due to hemorrhage, which is also not commonly seen.[14]

Table 2.6 Causes of maternal mortality: Indian studies and global pattern (percent of total deaths by causes)

Causes of death	RGI[8] data 1998 (n=498)	Bhatia[4] data 1984-85 (n=262)	Kumar[5] data 1986 (n=55)	Maine[13]
	National	Anathapur district	Rural north India	Global pattern
Hemorrhage	29.6	6.8	18.2	28
Anemia	19.0	9.2	16.4	--
Hypertensive disease of pregnancy	8.3	8.0	5.5	17
Puerperal sepsis	16.1	30.5	16.4	11
Abortion	8.9	10.3	9.1	19
Obstructed labor/malpresentation	9.5	4.9	7.3	11
Not classifiable	2.1	--	10.9	--
Other/indirect	6.4	25.9	10.9	15

Researchers have examined risk factors for maternal mortality in the past. Their studies show that common risk factors of maternal mortality are: a mother's age below 20 or above 35 primipara or parity above 4, illiteracy, poor socio-economic status, and lack of ANC. Some of the less commonly identified factors include bad obstetric history, anemia, maternal complications and diseases, and delivery by an unskilled person.[4,5,6]

New Understanding of Preventing Maternal Mortality

In the 1960s and 1970s, maternal health services under maternal and child health (MCH) focused on ANC and high-risk pregnancies. The prevailing view among health providers globally was that good ANC along with the high-risk approach would help reduce maternal mortality. Since TBAs conducted so many deliveries, it seemed logical that training TBAs in maternal care would reduce the MMR. However, in spite of implementing this approach for several years, maternal mortality remained very high in many developing countries, including India. A re-examination of the causes of maternal death and contributing socio-medical factors led to a new understanding of how to prevent maternal mortality.[13] This research showed the following:

- It is not possible to predict which mother will develop complications; hence, the high-risk approach is not very effective.
- Most complications cannot be prevented by good ANC, which therefore cannot prevent maternal mortality.
- If obstetric complications are handled effectively, mortality could be substantially reduced.
- Once major obstetric complications leading to death develop, even a trained TBA or a nurse cannot do much at home since many of these complications require surgical interventions, antibiotics, blood transfusions or other aggressive treatment.
- A cost-effective approach to reducing maternal mortality should ensure high-quality emergency obstetric care (EmOC) to mothers who develop complications during delivery.

Given these findings, first referral units (FRUs) were proposed as the means for providing EmOC — the most cost-effective way to reduce maternal mortality.[13] Many international organizations accepted this approach, which is the main strategy for preventing maternal mortality in many country programs.[18]

Policy and Program Goals in India Aimed at Reducing Maternal Mortality

Table 2.7 gives various MMR reduction goals as enshrined in important policy and program documents.

Table 2.7 Major policy and program goals in maternal health

Year	Document	Goals
1983	Health policy statement by the Government of India[19]	MMR reduction to 200-300 by 1990, and below 200 by 2000
2000	National Population Policy[20]	MMR reduction to less than 100 by 2010
2002	National Health Policy[21]	MMR reduction to less than 100 by 2010
2002-2007	Tenth Five-Year Plan[22]	MMR reduction to less than 200 by 2007

In spite of these clear policy intentions, progress on the ground has been very slow. A review of the 8th Five-Year Plan (1992-96)[23] and the 9th Five-Year Plan[24] (1997-2002) shows that there was hardly any description of strategies, achievements, or goals related to maternal care and maternal mortality.

The Government Structure for Maternal Health and Shifting the Focus of Its Activities

Beginning in the 1950s the Government of India began to create the primary heath care infrastructure consisting of district hospitals, community health centers (CHCs)/rural hospitals, primary health centers (PHCs), and subcenters (SCs) in the country. Each of these centers was to provide maternal health care,

including ANC, delivery care, and postnatal care. In the 1950s and early 1960s, the primary health care system seemed to be focused on basic health care, including maternal health, even though coverage was limited due to small numbers of centers. After 1966, however, as the family planning (FP) program became target-oriented, maternal health services fell into neglect.. This trend was further aggravated by the launch of the universal immunization program in the mid-1980s and polio eradication in the mid-1990s. Auxiliary nurse midwives (ANMs) and medical officers were held more and more accountable for performance of FP and immunization targets and not for maternal health. In spite of specific policy goals for reducing maternal mortality (Table 2.7), skilled health staff (doctors and midwives) received no encouragement — nor were they monitored for — conducting deliveries in health facilities.. Maternal deaths remained unregistered, unaudited, and unaccounted for. The implicit message to the health system was that maternal health was apparently not a priority.

This neglect of maternal care was further compounded by an exclusive reliance on ANC interventions (essentially, TT immunization and iron folic acid, (IFA) supplementation). Intranatal care, efforts to promote the high-risk approach, and the training of TBAs, were neglected. The emphasis on ANC interventions gave program managers a false sense of security that the problem of maternal mortality was being addressed. And the absence of major maternal mortality studies in India prevented anyone from realizing that maternal mortality remained high.

Lack of Independent Advocates for Maternal Health in the Civil Society

The efforts of the Federation of the Obstetricians and Gynecologists (FOGSI), the Indian Medical Association (IMA), and other professional organizations to promote maternal health had only a limited impact. Collaboration among such professional bodies and the government on maternal health issues has been weak. Women's groups that are very active in blocking new contraceptives have neglected the tragedy of maternal mortality, and political parties and leaders have not played any active role in promoting maternal health. Most international agencies have typically focused on FP and child survival (CS) – often neglecting maternal health. As maternal death and disability do not cause any obvious epidemics, even the mass media hardly pays attention to this tragedy. Consumer groups, the judiciary, and members of legislative assemblies and parliament also ignored maternal mortality for many years. Maternal death never became an issue or priority among decision-makers.

Special Programs for Maternal Health

With revitalized global interest in maternal mortality following the Safe Motherhood (SM) conference in Nairobi in 1987, the United Nations Children's Fund (UNICEF)-India and the Government of India took the lead in reorienting national programming toward SM. During the early 1990s, a Child Survival and Safe Motherhood (CSSM) program was developed with support from the World Bank and other donors. This was the first systematic effort to address high maternal mortality, and it was followed in 1997 by the Reproductive and Child Health (RCH) program.

CSSM

CSSM was a five-year program that started in 1992. The total program budget was about $330 million, with half of this amount assigned to SM activities.[25]

Program Design

The CSSM program had two major objectives: to reduce infant and childhood mortality and to reduce maternal mortality. The key interventions of this program are listed in Table 2.8.[26]

Table 2.8 Key interventions in the CSSM program

CS interventions	SM interventions
ENC	Immunization for pregnant women with TT
Immunization for children	Prevention and treatment of anemia
Management of diarrhea	ANC and early identification of maternal complications
Management of ARIs	Delivery by trained personnel (including trained TBAs)
Vitamin A prophylaxis	Promotion of institutional deliveries
	Management of obstetric emergencies
	Birth spacing

ARI=Acute respiratory infection

The goal set for the SM part of the program was to reduce maternal mortality from 4 per 1,000 births to 2 per 1,000 births by 2000.

The strategy for reducing maternal mortality included:

- Establishing FRUs for providing comprehensive EmOC by upgrading existing CHCs (30-bed rural hospitals);
- Improving maternal care including ANC/high-risk detection at the village level by converting existing village-level immunization sessions to mother-and-child protection sessions;
- Continuing the training of TBAs;
- Providing ANMs with medicine kits;
- Promoting information, education, and communication (IEC) activities to make people aware of this new program;
- Training staff at various levels to orient them to new initiatives and upgrade their skills;
- Supplying equipment to district hospitals, FRUs, PHCs, and SC.

Under the CSSM program, a monitoring system was to be developed to assess program output and impact. The project was to be implemented through the existing staff. The District Immunization Officer was to look after the CSSM program and the state MCH Officer was in charge at the state level.[25,26]

Implementation, Issues, and Problems

Training

The short term (six day) training was more like an orientation and did not build skills, while the long-term (3-4 month) skills training for EmOC and neonatal care never took off. There was very little focus on maternal health, and there was no coordination between training, supplies, and monitoring.[27,28,29]

Equipment

A large amount of high quality, useful equipment was purchased by the government, but there were delays in supplying it to the requisite facilities. No equipment maintenance system was ever developed.[29] Not surprisingly, much of the equipment was hardly put to actual use.

Staffing

Under the CSSM program, no additional staff members were recruited. No effort was made to compile data at the national level on the staffing of FRUs, a critical bottleneck. It is estimated that only about half of the 1,748 FRUs identified are functional, primarily due to the lack of key staff, especially obstetricians and anesthetists.[30,31] The facility survey done in 1999 under the RCH program confirmed that staffing was a major problem in many FRUs and also in some district hospitals (Table 2.9). The survey also showed that the existing staff lacked training.

Table 2.9 Proportion (%) of health care establishments having specific staff and specific trainings [32]

Staff category(N=)	Proportions (%) having staff		
	DH (210)	FRU(766)	CHC(886)
Obstetrician/gynecologist	78	48	28
Pediatrician	78	37	19
RTI/STI specialist	35	08	03
Pathologist	45	10	06
Anesthetist	70	22	10
Laboratory technician	93	86	74
Staff nurse	94	93	87
Pharmacist	96	92	88
Training of medical officers in specific skills			
Sterilization	32	28	21
IUD insertion	25	27	22
Emergency contraception	19	17	11
RTI/STI	24	26	21
Newborn care	21	22	17
EmOC	19	17	11

One shortcoming of the CSSM program was a lack of training in necessary skills for different cadres of health providers. A substantial part of EmOC work can be done by a doctor with an MBBS degree and by nurse-midwives with some additional training. But upgrading the skills of doctors working in PHCs or FRUs has not been done in most states; one of the reasons cited for this was a fear of litigation under the Consumer Protection Act.

IEC and community participation

Some efforts were made to generate awareness through IEC, but they were limited in scope and coverage. SM messages received low priority in IEC, and within SM messages the focus was on ANC, TT immunization, and IFA supplementation rather than on complications that kill mothers and the need for EmOC.

Service delivery

Many of the interventions envisaged in the SM component of the CSSM program never got implemented or remained weak. These included mother-and-child protection sessions to provide ANC at the village level, identification of high-risk mothers and complications during delivery, and EmOC through FRUs. Even the content of ANC was limited to TT vaccination and IFA distribution.[33]

A rapid household survey done in 1998-99 showed great variation in the coverage of ANC, TT, IFA, and institutional deliveries. Generally coverage was high in southern states and low in northern states. It was also shown that the content of ANC was limited. Thus, service delivery did not improve much for maternal care interventions under the CSSM program.

Access to blood

No systematic efforts were made in the CSSM program to improve access to blood at FRUs. On the contrary, during this project period access to blood became more difficult as the Honorable Supreme Court passed an order to ensure standards of blood banks set by government were adhered to. Due to these standards, some blood banks in the rural areas had to be closed down. In areas where blood banks were nonexistent, un-banked but tested blood could not be given to patients, even as a lifesaving measure. This improved the safety of blood transfusion, but made it unavailable for many people in rural areas.[34] Unfortunately, the situation has not changed substantially even under the RCH program. In December 2001, the government allowed the opening of smaller blood storage units at FRUs and at PHCs, but as of this writing hardly any of these units have started to function in rural areas.

Supervision and monitoring

The supervision and monitoring aspects of the program focused much more on some CS interventions, such as immunization, and only a few SM interventions, such as TT immunization and distribution of IFA tablets. There was hardly any monitoring of the operationalizing and functioning of the FRUs, even though guidelines for this were established in 1992. Even now it is hard to get data on basic parameters, such as how many FRUs are fully functional and how many EmOC procedures, including cesarean sections, have been done at FRUs.

National and regional level maternal mortality review committees, recommended in the 1992 staff appraisal report of the World Bank,[25] were never established. Sri Lanka was able to establish a reliable birth and death recording system in the 1940s. The Sri Lankan Family Health Bureau has been conducting a confidential inquiry into each death for the last several years.[35]

Impact of the CSSM Program

The CSSM program modified the existing management information system (MIS) to help monitor program outputs. Most information in this new MIS was focused on the immunization and FP programs, and the little information on maternal health that was collected was unreliable. For example, in 1996 less than 10 percent of maternal deaths were being reported in the CSSM MIS,[29] and in 1999, information from one of the more advanced states showed that only about 20 percent of maternal mortality was reported(personal communication).. Some data collected on the number of cesarean sections performed in FRUs in three districts of an advanced state indicated that each FRU was conducting about 22 cesarean sections in one year while the estimated need was about 600 in one year per FRU. This indicates the profoundly low level of performance of FRUs.

There has not been any systematic national study to assess the impact of the CSSM program. Only a few quick reviews have been carried out, providing patchy information on the program implementation and outcomes.[28,29,36] The second round of the NFHS in 1998-99 shows almost no improvement in ANC, reasonable improvement in TT vaccination coverage, and some improvement in institutional deliveries. The latter is mainly due to an increase in deliveries in private institutions and not in public institutions, a finding that therefore cannot be attributed to the CSSM program. Cesarean section deliveries have substantially increased, probably due to the private sector contribution in urban areas (Table 2.10).

Table 2.10 Maternal health indicators in NFHS 1 and 2 surveys[7,10]

Maternal care indicators	NFHS I 1992-93	NFHS II 1998-99
ANC according to source of ANC care		
At home by health worker	12.8%	5.6%
Doctor	39.8%	48.6%
Other health professional	9.3%	10.9%
TBA	0.3%	0.2%
No ANC	36.8%	34.0%
Number of ANC visits		
None	36.8%	34.0%
1 visit	6.1%	8.2%
2-3 visits	29.3%	27.6%
4+ visits	26.9%	29.5%
Stage of pregnancy at first ANC visit		
No ANC	36.8%	34.0%
Ist trimester	24.0%	33.0%
IInd trimester	27.2%	25.2%
IIIrd trimester	11.4%	7.4%
Tetanus toxoid vaccination (of mother)		
None	39.0%	24.1%
One	7.1%	8.2%
Two or more	53.8%	66.8%
Iron and folic acid tablets or syrup		
Any iron and FA acid tablet or syrup	50.5%	57.6%
Received supply for 3+ months	NA	82.5%
Consumed all the supply	NA	80.5%
Place of delivery		
Public health facility	14.6%	16.2%
Private health facility	10.9%	17.4%
Home (own)	61.6%	53.2%
Home (parents)	11.9%	12.2%
Assistance during delivery		
Doctor	21.6%	30.3%
ANM/nurse/midwife	12.6%	12.0%
TBA	35.2%	35.0%
Relative/other	29.5%	22.4%
None	0.6%	NA
Complications at delivery		
No complication	87.9%	NA
Cesarean section	2.5%	7.1%

Note: Don't know or missing values not given which was less than 1 % for all indicators.
NA=not available

Even child immunization, the main priority in CSSM, showed only moderate improvement. A recent Demographic and Health Survey (DHS) (1999-2000) in Bangladesh, a poorer country, has reported full immunization coverage of 60 percent, which is much higher than India.[37]

Recently under the RCH project, a rapid household survey has been done in most districts in 1998-1999.[38] This survey tracked indicators such as ANC and place of delivery, showing that even though 75 percent of women got the minimum ANC package and TT, only 32 percent got the minimum ANC package (i.e., three ANC visits, TT immunization, and IFA supplementation).

Some data available from the RGI's SRS and other sources for the last several years is presented in Table 2.11 to show trends over time.

Table 2. 11 IMR, crude birth rate, coverage of TT immunization and IFA, and type of attendants at delivery in India

Program/year	1983	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	UIP program			CSSM program					RCH program					
Infant mortality rate	105	80	80	79	78	74	74	72	71	72	70	68	66	64
Crude birth rate†	33.7	30.2	29.5	29.2	28.7	28.7	28.3	27.5	27.2	26.5	26.1	25.8		25
TT (%) immunization			55*	53.8*			67‡			66.8%#				
IFA coverage			51*	50.5*			69‡			57.6%#				
% births in institutions	19.2†	22.9†	24.3†	25.5*		22.3†	25.2†	25.2†		33.6%				
% births (at home) attended by trained professionals	18.1†	21.3†	21.9†	34.2*		27.7†	28.2†	28.5†		42.3%#				

† Data from Sample Registration System (SRS Reports of various years), *NFHS I
‡ Multi Indicator Cluster Surveys MICS (commissioned by UNICEF), #NFHS II 1998-99 [10]
UIP= Universal Immunization Program; CBR=Crude birth rate

This table indicates there has not been any substantial improvement in these indicators after the CSSM program except in TT immunization. The recent data shows that IFA distribution may have increased due to the CSSM program but declined again after the program, indicating the likelihood that some of the other improvements may have slid back after the program ended. There is overall improvement over the last several years (even before CSSM), which has continued in other indicators such as births at home attended by trained professionals and institutional births, possibly due to an overall improvement in the socio-economic status and rapid expansion of private health care facilities. Thus, the available data do not indicate any great improvement in maternal health in the course of the CSSM program.

One may want to ask the question that given all the problems of implementation in the SM component of CSSM enumerated above, is it even worth looking at the impact of the SM component of CSSM program? Because several of the interventions planned did not take place, it is hard to imagine that the program had any substantial impact on maternal mortality and morbidity.

Reproductive and Child Health Program

Following the International Conference on Population and Development (ICPD) recommendations, the Government of India started the process of reorienting the FP and MCH program into the new RCH program.[39] The total budget envisaged for this program was roughly $1.2 billion, $309 million from the World Bank and about $250 million from the European Commission under a sector-wide reform project called the Health and Family Welfare Sector Program. The objective of the RCH program is to improve reproductive health, including maternal health and child health. The World Bank project appraisal documents show that substantial background work and thinking has gone into the development of the RCH project.[40,41,42] The key program elements as indicated in Government of India documents titled "Schemes for Implementation" follow:

- Immunization
- Essential obstetric care
- EmOC
- 24-hour deliveries at PHCs/CHCs
- Referral transport to indigent families
- Blood supply at FRUs
- ENC
- Medical termination of pregnancy
- Reproductive tract infection (RTI)/sexually transmitted infection (STI)
- Several other components including promotion of Indian systems of medicine, special programs for urban slums, tribal areas, and adolescents, research, training, IEC, involvement of NGOs, MIS, supplies and logistics, and minor civil works

The RCH program was officially started in October 1997 and became operational as a composite of individual schemes with less than ideal linkages, rather than an integrated program. For example, some PHCs and CHCs got renovated, others got staff, and some villages got transport money. Given that the new RCH program had many components—FP, maternal health, child health, RTI/STI—the focus on EmOC inevitably got diluted.

Even though the RCH program is about to finish not many evaluations have been done. Even the annual report of the Ministry of Health and Family Welfare for the year 2001-2002 only mentions various schemes and provisions but does not provide any data on the number of beneficiaries, their coverage, their utility, or lessons learned.[43] Hence the views presented here about the program are not based on data or evaluations but on an analysis of program design and a general understanding of the field realities.

Staffing

The RCH program provides for additional ANMs, staff nurses or public health nurses at difficult SCs and PHCs to improve access to maternal care services. They are recruited on a contract basis, and only some states have succeeded in recruiting efforts. The RCH program proposed to hire specialists (anesthetists and obstetricians) on contract, but in most remote, rural areas, such specialists are not available to staff government centers on contract. Such contract specialists can perhaps provide routine care at pre-planned hours and days, but cannot be relied upon for providing emergency care 24 hours a day, 7 days a week. Another issue is that in many places there could be a conflict of interest for the private practitioners, as good services in the public sector may mean less private practice in their own hospitals.

The proposal to train more anesthetists in the RCH program was not implemented until 2002. Fortunately, a bold policy decision has been taken recently by the government to train medical officers in a short course for anesthesia and resuscitation for EmOC. In 2002 a module was designed for training medical officers, and in 2003 the first batch of medical officers received training in anesthesia at the All India Institute of Medical Sciences. The country needs at least 2,000 medical officers to provide anesthesia for its FRUs and district hospitals. A proposal to train medical officers in conducting cesarean deliveries is also under consideration by the Government of India.

Availability of blood

In most districts there is only one blood bank each for 1.5-2 million people. Some districts have no functional blood banks due to equipment failure, and in many district hospitals there is a constant shortage of blood. Recently, permission has been given to establish blood storage facilities at FRUs, and guidelines circulated. Cost-recovery policy for blood in some states has added one more barrier for poor women who need blood in obstetric emergencies. Under the RCH program the blood supply has not improved much.

Supervision and monitoring

The supervision and monitoring aspects seem to be weak. Fortunately, the RCH project has commissioned independent district-level surveys to assess the availability and use of RCH services. The RCH document lists the following indicators for joint monitoring by the Government of India and the World Bank:

- Proportion of safe deliveries (including those by trained TBAs)
- Use of RCH care (including complications of delivery)
- Couple protection rate
- NMR and IMR
- MMR.

Institutional Deliveries

In order to encourage institutional deliveries, one solution offered by the program is to pay an additional honorarium to the PHC and CHC staff for doing deliveries after "office hours." There is no evaluation of this scheme, but anecdotal reports indicate that it may have encouraged inflated reporting of night deliveries just to get the incentive money.

Training

Substantial training efforts were planned under the RCH with the help of the National Institute of Health and Family Welfare (NIHFW) and the state-level training institutions. The review of the training effort showed that only a small proportion of the training load could be covered until March 2002.[46] The skills training was too short (only two weeks) and had too many topics to cover, giving very limited time to each topic, including maternal health. Given its short duration, this training only served to be an orientation rather than skills development.

Referral Transport

Under the RCH program, Rs5,000 were given to selected village *Panchayats* (elected councils) to provide emergency transport to women with complications of delivery. There is no evidence that this strategy has worked to improve the referral of women in emergencies. In most places, such monies were not utilized.

Quality Improvement

RCH program documents mention quality improvement as one of the key elements, but there have been no effort specifically directed at quality improvement except some orientation-type training. In many health facilities, quality of care is poor. Many of the buildings, especially critical ones such as operation theaters and labor rooms, badly need repair and renovation. Most health facilities do not use evidence-based clinical case management protocols. Even in the advanced states of Kerala and Tamil Nadu, such protocols are just being developed. Infection control is also poor in most facilities, and the clinical skills of many doctors and nurses need updating. Most facilities do not review or audit adverse events, including maternal deaths. ANC lacks quality and often does not include counselling on birth preparedness or danger signs. Thus, the overall

quality of maternal health services leaves much to be desired.

Overall, it seems that the way the RCH program was designed and has been implemented so far is unlikely to make a substantial difference to MMR as many of the basic barriers in provision of maternal health services are not addressed systematically. There are some efforts in the right direction, such as starting a short training course in anesthesia and allowing blood storage units, but these have been started quite recently and are progressing very slowly. There is no effort to post the available qualified staff in the most optimal positions—at the FRUs. There is a concentration of specialists in medical colleges and large district hospitals with an acute shortage of staff in subdistrict hospitals and FRUs. There are also instances of specialists posted in PHCs and dispensaries where only a basic (nonspecialist) medical officer is needed.

Thus, some of the key policy and management problems in effectively implementing SM programs have not yet been addressed systematically and rapidly.[47,48] The hope is that these problems will be surmounted in phase II of the RCH program.

Models of SM Programs and New Initiatives

Improving access, utilization, and quality of emergency obstetric care

With funding support from the Averting Maternal Death and Disability (AMDD) program of Columbia University, UNICEF and UNFPA in India received support to improve the EmOC services in 10 districts in Rajasthan and 3 districts in Maharashtra. The project activities started with a baseline assessment in 2000. Key activities include: repair and renovation of selected facilities, provision of equipment and supplies, training, MIS improvement, quality improvement, and management improvement. In the last two years there have been some lessons learned in improving EmOC services. The key lessons are:

- Modest funding can help to improve the infrastructure to a reasonably safe and functional level, but this takes detailed planning, careful execution, and close monitoring of functionality and use of facilities.
- Short training of 2-3 weeks for doctors and nurses can improve their skills in providing basic EmOC.
- Focused attention to EmOC services will help overcome many barriers and make services functional, but only as part of a slow process.
- Management improvement, MIS, and quality improvement is possible, but needs technical inputs, follow-up, and management commitment.
- If services are available and quality improves, then utilization goes up.
- Several policy and management constraints such as lack of proper posting, transfer policy, accountability for work, and overall under-investments in facilities continue to retard progress. These issues need higher, state-level interventions rather than the current district focus.

This project showed that it is possible to improve EmOC services in India on a large scale in the government primary health system with moderate resources if the activities are focused with proper technical inputs. AMDD-assisted projects in Bangladesh, Nepal and Bhutan are also showing that it is possible to improve the provision of EmOC through planned intervention in the public system.

General Efforts and Programs

There are also positive examples of efforts being made to operationalize FRUs in some progressive states such as Kerala and Tamil Nadu with help from UNICEF. Both these states have developed a process to

certify the FRUs. In Kerala more than 80 percent of the FRUs are operational and in the near future it will be the first state to make all FRUs functional.

In many states large World Bank-assisted State Health Systems projects are helping to upgrade the district and subdistrict hospitals. While they do not have a specific focus on EmOC or emergency services in general, they do include them. If these projects are implemented properly, with a focus on operationalizing emergency services, then they may help improve EmOC services considerably.

Evolving Private-Public Mix of Services

In some parts of India there are public services, private services, and NGO services for maternal health, and given recent improvements in roads and access to transportation, many women with delivery complications are now reaching some EmOC facilities, even though most deliveries still take place at home. This situation is probably leading to lower maternal mortality. A study by MacCord et al. from the Jamkhed area of Maharashtra notes that such a public-private mix has evolved by default rather than design. The study argues that in such situations the best future course would be to provide social health insurance to the poor so they can access available maternal care.[49]

Increasing deliveries attended by skilled birth attendants

From historical trends of MMR in various western countries (Sweden, Holland and Denmark) and an analysis of the cause of decline in MMR, there is strong evidence that introducing skilled midwives to conduct deliveries has led to reductions in the MMR of as much as 250-300 per 100,000 live births. Midwifery-based maternal health services have traditionally been strong in some European countries, while the United States and England moved to doctor- and specialist-based maternal health.[50] Analysis of maternal health practices in various countries has led some international agencies, including WHO, to advocate for promoting skilled birth attendants (SBAs), including midwives and doctors but not trained TBAs.[18]

Therefore, in addition to EmOC services as a strategy to reduce MMR, a second and complementary model being promoted by WHO to reduce maternal mortality is to encourage skilled birth attendance. This is a major departure from training TBAs. The functions of SBAs include providing care for normal pregnancy, delivery, and the postpartum period, and providing emergency care for complications with appropriate referral for further treatment if needed. The delivery could take place at home or in an institution. SBAs include doctors, midwives, and nurses with midwifery training.

India has a huge cadre of ANMs (about 130,000) who are educated and trained in midwifery and thus fit the definition of SBA. Unfortunately, they conduct only 12 percent of deliveries. This is due to the fact that program priorities have emphasized FP and immunization as their main work and neglected delivery care. India also has a large number of PHCs, CHCs, and rural hospitals that can also provide delivery care. But here again the priority in the past and present has been FP and immunization, so these hospitals and health centers do not provide skilled care for deliveries. Priorities should be reoriented so each level of health infrastructure offers maternity care as one of its basic services. PHCs and CHCs should provide all the basic EmOC functions, with FRUs and DHs providing comprehensive EmOC 24 hours a day, 7 days a week. Unfortunately, none of the existing public health programs has really focused on improving skilled deliveries or EmOC; most of their programs focus on outreach workers and promoting village level primary preventive activities such as immunization and FP, while ignoring strengthening of secondary preventive services (early diagnosis and immediate treatment) at the higher levels.

New Cadre of Skilled Birth Attendants

The Government of India is piloting the development of a new cadre of private practitioner, called the community SBA. Such a cadre was mentioned briefly in the National Population Policy 2000. These

community SBAs will be educated women chosen from the community and trained for about one year in midwifery by the government, and then they will be allowed to practice midwifery in the community. Although they will not be employees of the government, the government may support them by providing some start-up inputs to set up their practices. This may be a good alternative for the families that can afford to pay for such services; but the poor and the marginalized may not be in a position to avail of the services of these providers. Creation and deployment of this new cadre of midwives should not divert attention from the more urgent task of operationalizing EmOC services and ensuring that existing ANMs and doctors provide skilled birth attendance at government facilities and in the communities.

Janani Suraksha Yojana

In April 2003, the Government of India introduced a new strategy called the Janani Suraksha Yojana (JSY). It is an amalgamation of schemes such as the national maternity benefit scheme, transport money for emergency cases, and referral fees for *dais* (TBAs). Under JSY, families below the poverty line will receive money at delivery in a governmental institution, the TBA facilitating the institutional deliveries would be compensated, and transport to the facility would also be paid.

Health Insurance for Women

In western countries health insurance is a well-established mechanism for covering the costs of care in pregnancy and childbirth. Unfortunately, it is not well developed in India except for organized sector employees and central government or para-governmental employees. Here we present some analyses of the current situation in health insurance in India in the context of maternal health.[51]

The Self-Employed Women's Association (SEWA) is a trade union of self-employed poor women. It has started a package of health, life, and asset insurance for its members in the last 10-12 years. It is a very low-cost insurance with a premium of Rs. 60 per year and limited benefits of Rs 1,000 per indoor treatment per year. This insurance covers normal delivery and other maternal health problems, but it only pays for inpatient treatments. There are a large number of members of this scheme, mainly in Gujarat. This scheme is innovative in the sense that it covers maternity costs, which most commercial insurance do not entertain.

Health insurance has been a recent development in India. Government insurance companies offer an insurance policy for covering the costs of indoor care, called Medi-claim. It has a variable coverage depending on the premium and the age of the client. However, it does not cover pregnancy and its complications because the insurance companies do not perceive pregnancy as a risk; they contend that it is a predictable event and hence cannot be covered. The Medi-claim policy premiums are only affordable to high- and middle-income groups.

Over the last two years the government has announced low cost and low coverage subsidized insurance policies—the "Jana Arogya Scheme." Unfortunately, these schemes copied from Medi-claim and hence do not cover pregnancy and its complications. Thus, it is clear that the national goal of reducing maternal mortality has not been reflected in health insurance so far. The persisting high MMR is a strong public health concern that justifies the extension of insurance benefits to delivery.

How to Improve the Effectiveness of SM Interventions

To ensure that the SM agenda under RCH II does not fall into neglect as it did in the earlier CSSM and RCH programs, the following recommendations are provided:

- High-priority, clear objectives and an effective long-term strategy for SM. Given that the RCH II program plans to cover an even wider spectrum of services than CSSM, it is very important that high priority should be given to SM. Under the overall aim of reducing maternal mortality, specific

long-term objectives, such as reducing the unmet need for EmOC and increasing coverage of skilled attendance, should be set up. Such clear objectives should be followed by an effective long-term strategy to increase access, use, and quality of EmOC and maternity services. For example, one objective could be that in the next five years each district will have at least three comprehensive EmOC facilities and six basic EmOC facilities which will function for 24 hours a day, 7 days a week.

- Detailed implementation guidelines and plans. For any program to be effectively implemented, detailed implementation guidelines and plans are needed (e.g., what normal maternity care and EmOC will be offered at various levels, how many EmOC centers per district will be made functional). The local managers should have the power to make the changes necessary to keep the service running without interruption.

- Coordination and consistency among objectives, inputs, process, supervision and monitoring. The project development process should ensure that all the critical inputs such as staff, drugs, and equipment are provided at strategic locations for addressing the objectives. It would also ensure that all the inputs are coordinated. The supervision and monitoring should assess the functioning of the facility, its output, and quality. The monitoring should be based on appropriate indicators such as the UN process indicators for EmOC. A national maternal mortality study should be carried out every 10 years to ensure that there are reliable data to indicate progress towards the ultimate goal of SM.

- Accountability of the staff and managers for quality services. The supervision and monitoring system should ensure the accountability of staff at various levels. It should ensure that they are present at their place of work, are providing high quality care 24 hours a day throughout the year, and are accountable for the outputs of the services they provide. Quality improvement systems such as the use of evidence-based protocols and criteria-based audit need to be instituted in each facility.

- Decentralized management and problem solving. The program should be managed in a decentralized way so that local managers can adapt it to suit local conditions and needs. The local managers should be given powers and funds to solve the problems so that the services are available in a continuous way.

- Good quality technical support. As this program has substantial technical components as compared to other preventive programs, the government needs high-quality technical support by public health experts, obstetricians, midwives, general practitioners, and management experts. There is also an urgent need to expand the extremely small size of the technical staff for maternal health in the ministry at state and central levels.

- Training and human resource development. In this program long-term skills development should be taken up for medical officers and nurses to provide basic EmOC services even in the absence of an obstetrician. Good performance should be recognized and rewarded, and inadequate performance should be duly corrected.

Conclusion

The review of SM efforts in India shows a mixed picture, with major initiatives being undertaken by the government in the last 10 years but without significant impact. The challenge is how to make the SM strategies in the second phase of the RCH program more successful. For this to happen, top-level priority has to be given to SM with a scientific strategy and detailed micro-level programming. The strengthening of EmOC should be the focus of this strategy, with increasing institutional births and deliveries by health professionals as an equally important component.

Given the large size of the country, the project managers and policymakers should focus on effective implementation of selected interventions to reduce maternal morality rather than trying to do many desirable but non-vital activities with little impact on maternal mortality. Follow-up to ensure proper implementation and to closely monitor progress is vital for success. Many long-term problems of the health system will have to be solved if the SM component of the RCH is to be implemented smoothly and effectively. It will take at least 10-15 years of consistent, concerted, and sincere effort for the program to get established and then to make a substantial difference to the maternal mortality burden. Adequate resources will have to be provided over the long term for the maternal health program to be properly implemented. This needs a high level of political and societal commitment to maternal health.

3 Newborn Health Issues

Low Birth Weight

In India the mean birth weight (BW) of normal newborns is reported to be between 2,800 and 3,000 gm.[1-19] However, a higher mean BW (3,110±450 gm) was noted among affluent families of south Delhi, indicating that the potential for fetal growth in Indian communities may be comparable to western standards once environmental constraints are overcome.[20] LBW denotes a BW of less than 2,500 gm.

LBW infants experience higher mortality and morbidities compared to normal birth weight (NBW) infants during the neonatal period.[1,2,8,13-15,21-23] In two community-based studies, the NMR among LBW infants was 11 and 13 times higher, respectively, compared to non-LBW infants (11 vs. 1 percent; 13 vs. 1 percent).[2,8] Even after the neonatal period, LBW infants remain vulnerable to malnutrition, recurrent infections, neuro-developmental disabilities, and death.[24-30]

A growing body of literature suggests that intrauterine growth restriction results in anomalous programming of affected fetuses, predisposing them to a variety of adult onset diseases such as diabetes, hyperlipidemia, hypertension, and coronary artery disease.[31-34] LBW therefore is a key risk factor for adverse outcomes in life.

A newborn infant can be LBW because of: suboptimal intrauterine growth [commonly known as intrauterine growth restriction (IUGR), a condition akin to malnutrition] or short gestation (less than 37 weeks). IUGR infant is also called a small-for-dates (SFD) neonate. At times an LBW neonate may be both preterm and an SFD infant.

The burden

A number of studies on incidence and risk factors have been undertaken in India in hospital as well as in community settings.[1-19] The reported incidence of LBW in communities varied widely across the studies. About one-third of all neonates are LBW as estimated by data from two recent, well-conducted community-based studies (Table 3.1).[1,35] UNICEF's State of the World's Children report cites a 30 percent incidence of LBW neonates in India.[36] There is no nationally representative study or surveillance system incorporating weight at birth.

Overall estimates indicate that around eight million LBW infants are born in India every year, or around 40 percent of the global burden of LBW infants.[21] Over three-fourths of LBW neonates in India are full term.[1,13,14] The incidence of preterm neonates in India ranges from 11-14 percent.[1,13]

Over 80 percent of LBW neonates weigh between 2,000 and 2,499 gm, about 15 percent weigh between 1,500 and1, 999 gm, and only 3 percent weigh less than 1,500 gm (Figure 3.1).

One study reported on LBW rates over 20 years from rural areas and towns in Tamil Nadu.[11] Though mean BW improved by only 52 gm, the LBW rate decreased by 10 percent over the period. There is no

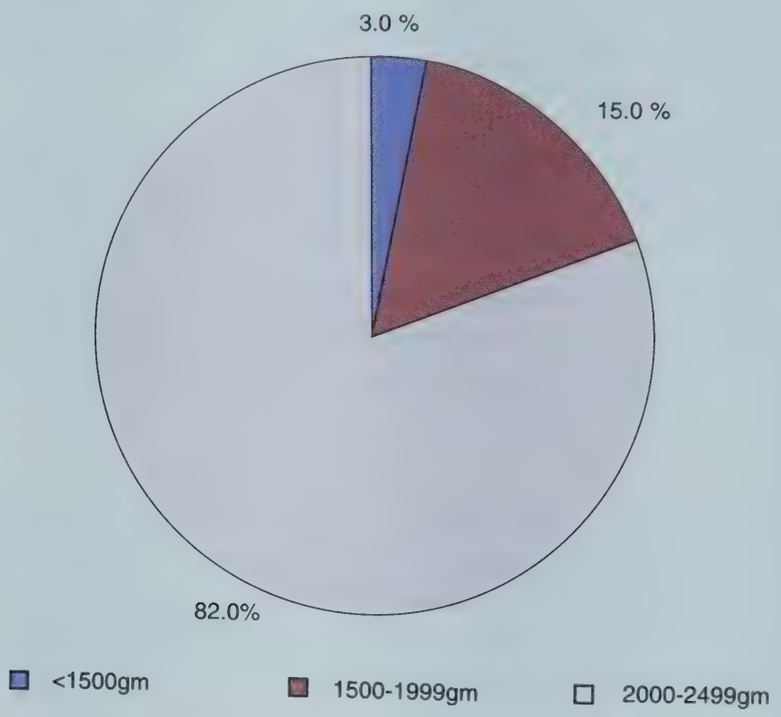
community based system in India to track the national incidence of LBW, and it is therefore not certain whether the LBW rate is rising, falling, or static, and available figures are from small, regional individual studies.

Table 3.1 Distribution of neonates by BW in two recent community-based studies

Authors	N	<1500 gm	1500 –1999gm	2000 – 2499 gm	> 2500 gm	Unknown
Bang et al. 1999[1] (Rural Maharashtra)	763	13 (1.7%)	61 (7.9%)	246 (32.3%)	417 (54.7%)	26 (3.4%)
Rahmathullah et al. 2003[35] (Rural Tamil Nadu)	11619	98 (0.8%)	553 (4.8%)	3020 (25.9%)	7948 (68.5%)	-

The National Neonatal Perinatal Database (NNPD) network of the National Neonatology Forum (NNF) of India reported data on 49,664 neonates born at 16 leading tertiary centers of the country during the year 2000.[14] LBW incidence was 32.8 percent, with 11 percent of infants being less than 2,000 gm and 3.7 percent less than 1,500 gm.

Figure 3.1 Breakdown of LBW population by weight



Based on the combined data of Bang et al. 1999[1] and Rahmathullah at al. 2003[35] (n=3991 LBW infants)

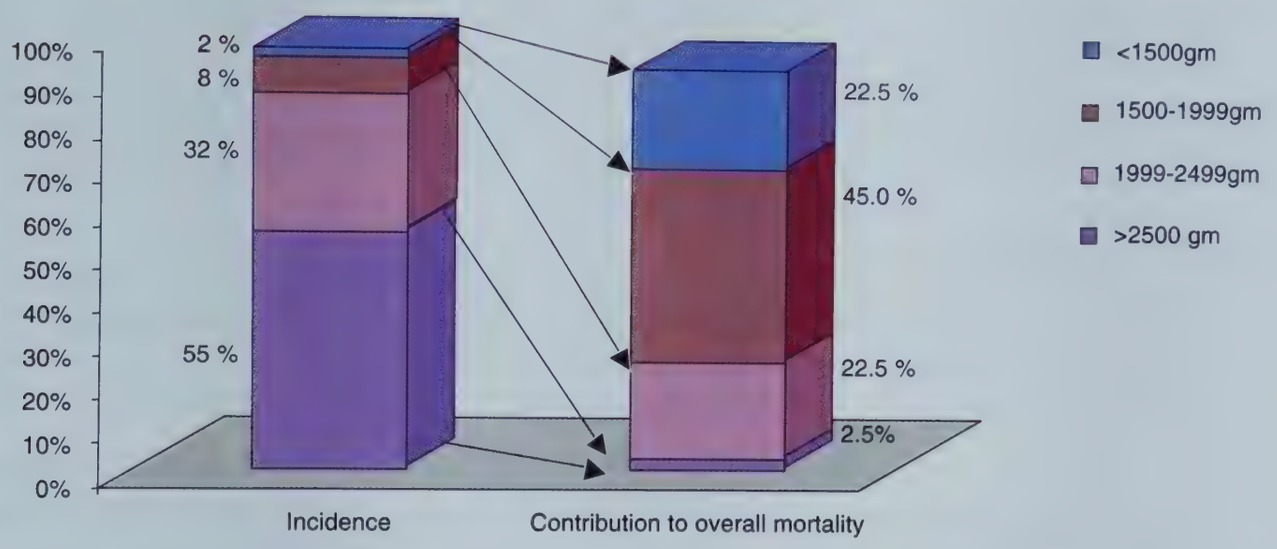
Contribution of LBW infants to overall neonatal mortality and morbidity

LBW is the single most important determinant of neonatal mortality and morbidities. Nearly three- fourths of neonatal deaths (Figure 3.2) and half of infant deaths occur among LBW babies.[8,13,14,21,22] A LBW neonate has many times higher risk of mortality as well as various morbidities compared to an NBW infant.[1,8,10,13,14,19,24,28-30] Prematurity and LBW were reported to be the most common causes of neonatal deaths in 1982-84 and in 1992-94 in rural areas of Haryana.[37] Bang reported that 95 percent (38 of 40) of

neonatal deaths occurred in LBW infants and 74 percent occurred in infants less than 2,000 gm (Table 3.2).[1] LBW infants between 1,750-2,500 gm contribute to a sizeable proportion of the total neonatal mortality.[1,8,13,14.38-44] This group of infants is potentially salvageable in the home as well as in a first-level health facility setting using simple and low-cost measures and therefore represents a target population for interventions.[2,8] Only a small fraction of LBW infants need to be cared for in better-equipped centers.

One study on trends in neonatal mortality in communities revealed a decline in overall neonatal mortality over 20 years; however , BW and gestation-specific risks of death in LBW infants remained over this period.[15]

Figure 3.2 Neonatal mortality by BW categories



Bang et al. 1999[1]; n=763 newborns and 40 neonatal deaths

Only a few studies reported the BW of stillborn infants. A higher incidence of perinatal deaths was reported in LBW infants.[14]

LBW infants are at a higher risk of asphyxia, sepsis, hypothermia, and feeding problems. Further, these morbidities tend to have a higher case fatality among LBW infants.[1,8,13,29] Common illnesses like diarrhea, respiratory infections, measles, and skin diseases are more severe and of longer duration in these infants.[8] The NNPD network also reported higher mortality in LBW infants (7.5 vs. 0.9 percent in NBW infants) in an inborn cohort.[14] Half of the outborn neonatal admissions at ten centers during the year 2000 were LBW. These infants had a higher mortality rate (23.4 percent) compared to NBW neonates (9.1 percent).[14]

Survival of LBW infants at present

Community Setting

In India over two-thirds of deliveries occur at home.[45] Many LBW infants born in this setting do not get optimum treatment and die at home.[1,2] In two community-based studies, it was shown that such infants tend to have very high mortality in the absence of any intervention.[1,8] However, using simple, low-cost interventions greatly improved survival among LBW neonates has been demonstrated (Table 3.2).[1] In another study, mortality in LBW infants declined by 39 percent with a package of specifically designed interventions.[8]

Table 3.2 Incidence, mortality, and case fatality in neonates by BW in a community trial in rural Maharashtra (Bang et al.)[1]

Birth weight	Before intervention			After intervention
	Incidence	Contribution to overall mortality	Case fatality rate	Case fatality rate
< 1500 gm	2%	22.5%	69.2%	25.0%*
1500-1999 gm	8%	45.0%	29.5%	10.6%*
2000-2499 gm	32%	22.5%	3.7%	1.6%
≥2500 gm	55%	2.5%	0.2%	0.9%

* Statistically significant difference following intervention

Rahamathullah et al. tested the impact of vitamin A supplementation (two doses; 24,000 IU each) soon after birth in a large, double-blind, randomized, placebo-controlled community trial in rural Tamil Nadu.[35] These neonates were followed up bi-weekly to the age of six months. Infants in the vitamin A group had a 22 percent reduction in total mortality (mortality rate 53.8 vs. 69.1 per 1,000 live births) compared with those in the placebo group. This beneficial effect was more marked in LBW infants, particularly in infants less than 2,000 gm.

First Level Referral Settings

Excellent survival of LBW neonates (2041/2109; 97 percent) was reported from a subdistrict hospital equipped with a pediatrician, general duty nurses, and a modest infrastructure.[39] A similarly rewarding experience was reported in another study.[41]

Tertiary Care Settings

The NNPD network reported a 91percent survival of LBW infants at 16 tertiary care centers during the year 2000. It also noticed an impressive decline in neonatal mortality that year in LBW infants compared with that of 1995 across all the BW categories at 10 collaborating centers of the network (Table 3.3).[14]

Table 3.3 Change in mortality of LBW infants at 10 NNPD network centers[14]

Birth weight	NNPD data 1995	NNPD data 2000	Change	P value
< 1000 gm	129/172(75%)	185/271(68%)	↓ 9.0%	0.12
1000-1500 gm	237/589(40%)	338/1025(33%)	↓ 18.0%	<0.01
1500-1999 gm	196/1515(13%)	188/2615(7%)	↓ 44.0%	<0.001

The etiology of LBW

LBW has largely been studied as a single group only.[4,7,9,10,16,17,18,46-66] Poor maternal nutrition and "too early, too frequent, and too many" pregnancies were the principal risk factors for LBW. Women with low income, a pre-pregnancy weight of less than 40-45 kg, a height of less than 145 cm, insufficient nutrient intake, low weight gain during pregnancy, and lacking ANC often produce LBW infants. In one study, maternal weight was a stronger risk factor than maternal height.[47] Weight gain during pregnancy was a critical determinant of BW; with every kilogram increase in weight gain during pregnancy, there was an eight percent reduction in the LBW rate.[10]

Maternal hypertensive disorders, anemia, hard physical labor, and tobacco exposure were also reported to be important risk factors, and the role of infections was included in a few studies.[52-56,63] Chlamydia and Ureaplasma urealyticum (but not *Mycoplasma hominis*) were the most common infections of the maternal lower genital tract.[54-57] Malaria was shown to occur with more severity during pregnancy and was a strong risk

factor for LBW.[53,63] Chlamydia was found to be associated with LBW in some studies, but not in others.[54-57] Mycoplasma was not associated with an increased risk of LBW.[58]

The causes and origins of LBW seem much more complex and remain elusive. Placental growth was poor in mothers who delivered LBW infants and was an independent risk factor for LBW in a community-based study.[52] This study found that fetal growth declined after 28 week of gestation in rural malnourished mothers.[53]

Genetic and ethnic factors may also have a role. Interestingly, Indian-born women and women of Indian descent living in western countries tend to have a lower mean BW and a higher LBW rate compared to their western counterparts.[16,17] This effect persists into the second generation, even after adjusting for important confounders like socioeconomic status and literacy.

The prevalence of putative risk factors is very high in the Indian population. The National Nutritional Monitoring Bureau reports that nearly one half of the adult Indian rural population is suffering from some level of chronic energy deficiency (CED).[58] Mean body mass index (BMI) values were lower in landless agricultural occupational groups and in low per capita income households compared with cultivators, artisans, and higher income groups.[58] Mean BWs also showed definite differences among BMI classes. The odds ratio for LBW was found to be three times more in severe CED groups of mothers compared to normal BMI groups. NFHS-II data showed that 58.2 percent of mothers were illiterate.[44] The median age of women at first delivery was 19.6 years.[44] Around half of married women age 20-24 were married before they were 18, and around 20 percent of adolescent married females were moderately to severely anemic – two potential risk factors for LBW births. Census 2001 data showed that firewood and other smoke-producing fuel, another risk factor for LBW, are used for cooking purpose in over 95 percent of rural households.[67]

Identifying LBW infants

Weighing the infant at birth is the gold standard for identifying LBW, but this is not a feasible option especially in home deliveries. Investigators have tried many methods for determining BW.[68-73] Infant weight taken within the first week after birth can be used as a predictor of BW.[73] A number of surrogate markers of LBW were tested in hospital as well as home settings, including mid-arm, chest, mid-thigh, and calf circumference, and foot length.[68-72] Individual studies have shown a good correlation of these markers, but no conclusive recommendations have emerged for a marker that could be used in the program setting.

Feeding LBW infants

In India LBW infants in neonatal units are routinely fed with a spoon or *paladai* (a traditional metallic infant feeding device comprised of a receptacle with a snout) rather than by bottle and nipple. Convincing empirical experiences in Tamil Nadu led to a rapid countrywide spread of this modality in the 1990s. Spoon, cup and *paladai* are proposed as more rational alternatives to bottle feeding because caregivers can ensure better cleanliness of these feeding devices.[74] Infants with a gestation of 32 weeks or more accept spoon or *paladai* feeds very well. In a controlled trial of alternate methods of oral feeding, LBW neonates ingested more volume of milk within lesser time with cup or *paladai* compared to bottle.[75]

Breastfeeding in LBW infants is associated with a lower mortality rate than artificially fed infants.[29,76-78] Better weight gain and lower incidence of diarrhea and respiratory tract infections were reported in exclusively breastfed compared to early-weaned infants.[29] This effect was more pronounced in LBW than in NBW infants.[29] In a recent community study, adequate growth was documented in LBW infants exclusively breastfed for the initial six months.[79]

Outcome for LBW infants

Morbidities and Mortality

LBW infants continued to exhibit higher mortality rates beyond the neonatal period, and this effect persisted until five years of age.[24,27] A quarter of LBW infants followed up in one community-based study died during infancy.[24] The IMR was nearly eight times higher in LBW compared to NBW infants.[8,13]

Morbidity and mortality patterns in a hospital-based cohort (Pune LBW study) of high-risk (mainly LBW <2,000gm) infants during six years after discharge was reported.[27] Out of a total of 40 deaths, 38 were reported during the first year after discharge. Of the 22 hospital deaths, 73 percent were due to infections.

The relative risk of diarrhea was much higher in early weaned LBW infants than in early weaned NBW infants compared to exclusively breastfed LBW or NBW infants respectively.[27,72,76] The incidence of diarrhea (per child per year) was 4.1 in the early-weaned compared to 0.5 in the exclusively breastfed in another study.[29]

Zinc supplementation may be beneficial in term LBW infants in preventing infectious disease morbidities, and thereby mortality. In a large randomized controlled trial in an urban slum community, zinc supplementation during the first year was associated with significantly lower mortality (relative risk, RR, of 0.32, 95 percent; confidence interval, CI, 0.12-0.89). Calcium, phosphorus, folate, and iron supplementation were not associated with a reduction in mortality.[80]

Growth

LBW infants tend to lag behind in somatic growth compared to NBW infants.[8,30] Catch-up growth occurred in preterm but less well in term LBW infants during early childhood.[30] The latter remained disadvantaged in somatic growth compared to NBW infants, even in adolescence.[30]

Neuro-developmental Outcome

The follow-up studies available are mainly hospital-based and focus on preterm LBW infants. Therefore, the findings of these studies cannot be applied to the LBW population of India as a whole since the latter consists mainly of term SFD infants. The Pune LBW study showed that around 10 percent of high-risk infants have major neuro-developmental disabilities at three years of corrected age.[25] The mean intelligence quotient (IQ) of LBW infants tested at six years of age was within normal limits (90.3), though significantly lower than controls (101.3).[26] Preterm SFDs had the lowest mean IQ. Visual-motor perception, preschool skills, and language development were poor in LBW children.[26] Larger numbers of LBW infants were found to have borderline intelligence in early childhood. At 12 years, the intelligence and academic performance of the children weighing less than 2,000 grams are significantly lower than that of controls, though within normal limits. They also have poor visual-motor perception, motor incompetence, and reading and mathematics learning disabilities. The preterm SFD and very low birth weight (VLBW) children had the poorest cognitive abilities. At 12 years, more preterm LBW infants had a lower intelligence quotient and functional abilities than term NBW infants; preterm SFDs were the worst affected.[81]

LBW and the fetal origin of adult diseases

A host of diseases such as hypertension, coronary artery disease, diabetes mellitus, and hyperlipidemia may be related to small size at birth (Barker hypothesis).[31-34] In a retrospective cohort study at Mysore, South India, it was shown that LBW, short birth length, and small head circumference at birth were associated with a greater risk of coronary artery disease, with the highest prevalence being in individuals who were LBW and whose mothers weighed less than 45 kg during pregnancy.[31] A cohort of hospital-born term LBW infants is being followed up at Pune. Higher glucose and insulin level after glucose challenge, suggesting deranged insulin metabolism, was reported among LBW infants at four years of age.[32] At eight years, current obesity strongly predicted insulin resistance. After adjusting for obesity, LBW was significantly associated with

insulin resistance and other cardio-vascular risk factors.[33,34] Children who were small but had grown heavy or tall in relation to mid- parental height were most likely to have insulin resistance and other cardiovascular risk factors. In a recent population-based study reported on 26 to 32 years of follow-up, there was an association between thinness in infancy and the presence of impaired glucose tolerance or diabetes in young adulthood.[82]

Immunity and vaccination in LBW infants

Studies have shown that LBW infants as a group have suboptimally developed humoral and cellular immunity.[83] The immune response to hepatitis B vaccination initiated at birth showed adequate immune response in preterm and term LBW infants in one study.[84] Another study, however, showed suboptimal response to three doses of hepatitis B vaccine in preterm LBW infants; optimal response was achieved with the fourth dose.[85] Bacillus Calmette-Guerin (BCG) vaccine was found to be equally immunogenic in LBW as well as in NBW infants.[86]

Prevention of LBW

Mainly nutritional interventions aimed at preventing LBW births have been studied in India.[4,46,48,54,87-90] The impact of nutritional supplementation (400 calories and 20 gm protein per day) under the ICDS program was explored in a cohort study.[4] The result was that supplemented mothers in the ICDS area had a higher mean BW by 25 and 58 gm compared to unsupplemented women in the ICDS area and women in the non-ICDS area, respectively. The LBW rate in supplemented women in the ICDS area was also lower (14.4 percent) than both unsupplemented women in the ICDS area (20.4 percent) and women in the non-ICDS area (26.3 percent).

The relationship between the intake of micronutrient-rich food and the size of the infant at birth was studied in a rural community near Pune.[48] Maternal energy and protein intake did not influence BW. However, a strong association was noted between folate status and intake of foods rich in micronutrients, such as milk, green leafy vegetables, and fruits. This study raised the possibility that the availability of micronutrients might be an important limiting factor for fetal growth in an undernourished community. Folic acid supplementation during pregnancy was shown to improveBW.[88]The same results were replicated in a recent large community trial conducted in Nepal.[89] This study did not show that zinc supplementation had any effect during pregnancy.

A randomized trial compared the efficacy of two ANC packages in a rural community in Tamil Nadu.[87] The HR package was more efficacious with respect to maternal morbidities, preventable neonatal morbidities, and LBW, and consequently the overall outcome was better in the HR series than in the universal ANC package.

In another randomized controlled trial, erythromycin treatment starting in the second trimester aimed at treating genital infections neither improved BW nor reduced the incidence of LBW or the prematurity rate.[90]

Conclusion

About a third of neonates born every year are LBW, with the majority weighing above 2,000 gm. LBW infants tend to have higher mortality and morbidity during the neonatal period, and this disadvantage continues into childhood, resulting in lower growth potential. Maternal malnutrition and ill health, high fertility rate, teenage pregnancy, and maternal infections are the possible major risk factors. Presently, there is no effective preventive measure to avert or decrease the birth of LBW infants. Good survival of LBW infants can be achieved in the home as well as in community hospital settings using low-cost measures. Zinc and vitamin A supplementation in LBW infants may decrease mortality during the first year. Further research is required to develop replicable models of care of LBW infants at different levels to better understand the epidemiology and to prevent the occurrence of LBW, especially IUGR births.

Major Neonatal Disorders

Neonatal sepsis (NNS)

NNS is the leading cause of death and morbidity in neonates in community as well as hospital settings.[1,2] Field studies have shown that NNS can be diagnosed and managed well by health workers in community settings.[3]

The Burden

Community-based studies

In a community-based study by SEARCH, VHWs followed 763 neonates from birth through four weeks in rural areas of Maharastha.[3,4] The diagnosis of NNS was based on clinical criteria. VHWs found the incidence of NNS to be 17 percent, with a case fatality rate (CFR) of 18.5 percent. NNS was reported to be the primary cause of death in over half of all cases.

In a study on neonatal morbidity and mortality in 40 Anganwadi centers in the urban slums of Gorakhpur city, the incidence of NNS was 2.7 percent of live births, with one third acquiring the condition within seven days of life.[5] NNS was the primary cause of death in 20 percent (10/50) of neonatal deaths. In another study from the urban slums of Jabalpur city under the ICDS Scheme, NNS was reported to account for 7 of 35 deaths (20.5 percent) during the first month of life.[6] A verbal autopsy was conducted in a study of 1,000 neonatal deaths in and around Patna.[7] NNS was assigned as the primary cause of death in 20 percent of neonatal deaths. NNS was a cause of death in 10 percent of total neonatal deaths as determined by verbal autopsy in a community development block of Haryana.[8] In another study conducted in urban slum ICDS areas in Lucknow city, NNS was responsible for one third (7/21) of early neonatal deaths.[9]

Hospital-based studies

NNS is the most common indication for admission of neonates brought from the community to subdistrict, district, and tertiary care hospitals.[10-12]

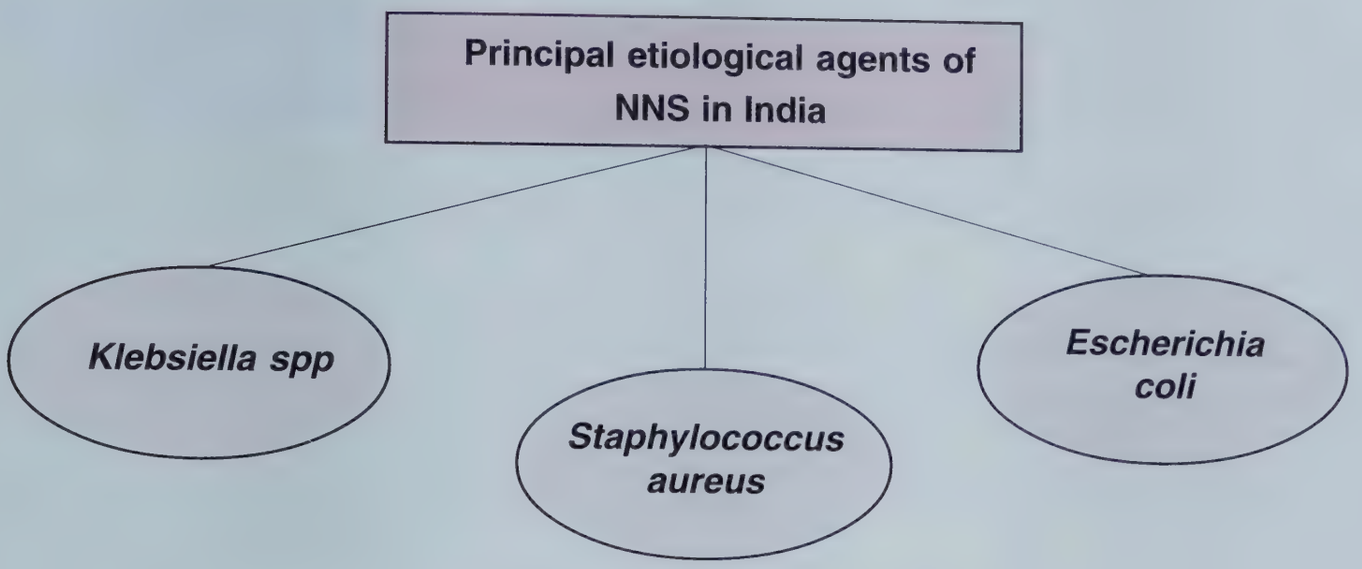
The NNPD Network conducted the largest hospital-based study, enrolling 49,664 inborn neonates at 16 tertiary centers.[13] The incidence of NNS was 3.8 percent, and the culture positivity rate was 41.4 percent. NNS accounted for 23 percent of total neonatal deaths. The network also reported data on outborn infants (n=3831) during the same year. NNS was the most common morbidity (28.4 percent of neonates), as well as the most common primary cause of death (36 percent of the total of 630 neonatal deaths). The network compared a few indices on an inborn cohort of 2,000 with those of 1995 at ten centers; there was a 7 percent reduction in the incidence of NNS over this period.

Chaturvedi et al. reported that 12-21 percent of neonates in a rural medical college hospital setting died because of sepsis.[10] Over 90 percent of newborn admissions at district and subdistrict hospitals were due to NNS.[11] NNS was the primary cause of death in over half of all neonatal deaths at a subdistrict facility.[12]

Organisms Causing NNS

It appears that overall, *Klebsiella spp*, *Staphylococcus aureus*, and *Escherichia coli* are the predominant organisms of NNS in India (Figure 3.3). There is no published study on the organisms causing sepsis in the community setting.

Figure 3.3 Organisms causing NNS



First-level health facility and home-delivered neonates

Chaturvedi reported Gram-negative organisms (60 percent) and Gram-positive organisms (40 percent) in 847 positive blood cultures in NNS cases from a rural medical college hospital between 1983 and 1987.[14] The principal organisms included *Klebsiella spp* (25 percent), coagulase negative *Staphylococcus* (24 percent), *Escherichia coli* (16 percent), *Pseudomonas spp* (13.4 percent) and *Staphylococcus aureus* (12 percent). Rao et al. reported organisms of NNS (n=640) from a rural medical college hospital in Karnataka.[15] The organisms isolated included *Staphylococcus epidermidis* (18.9 percent), *Pseudomonas spp* (11.8 percent), *Citrobacter spp* (9.4 percent), *Klebsiella spp,* and *Escherichia coli* (9 percent each). One hospital-based study reported on the organisms responsible for sepsis in home-delivered infants (n=47).[16] The offending organisms included coagulase negative *Staphylococci* (39.5 percent), group B *Streptococcus* (11.6 percent), *Staphylococcus aureus* (9.3 percent), *Klebsiella spp* (9.3 percent), *Pseudomonas spp* (6.9 percent), and *Escherichia coli* (6.9 percent).

Hospital-based studies

The best source of data on etiologic organisms from large hospitals is the NNPD.[13] At 16 centers of the network, organisms grown in blood cultures (n=909 from 793 neonates) included *Klebsiella spp* (31 percent) *Staphylococcus aureus* (18 percent), *Escherichia coli* (11 percent), *Pseudomonas spp* (7 percent), and *Staphylococcus albus* (6 percent). Among outborn infants, the organisms (n=484 from 432 infants) were *Klebsiella spp* (36 percent), *Staphylococcus aureus* (14 percent), *Pseudomonas* (13 percent), *Escherichia coli* (8 percent), and *Staphylococcus albus* (5 percent). Group B *Streptococcus* is not an important etiologic agent of NNS in India.

Antibiotic sensitivity patterns in organisms causing sepsis

One study in Pondicherry reported on organisms in home-delivered neonates with meningitis.[16] All the organisms grown in CSF (n=11) showed uniform sensitivity to ampicillin and cefotaxime. The NNPD network reported on the antibiotic sensitivity patterns of organisms isolated from inborn infants (Table 3.4).[13] The network reported a high degree of resistance to commonly used drugs, including gentamicin, amikacin, and third generation cephalosporins. In a recent study, extended spectrum beta lactamase production was shown in 86.6 percent of *Klebsiella spp*, 73.4 percent of *Enterobacter spp*, and 63.6 percent of *E. coli* strains.[17] It was observed that 74.4-80.9 percent of these ESBL producers were resistant to cefotaxime, and 47.6-59.5 percent were resistant to ceftazidime in routine susceptibility testing.[17]

Table 3.4 Resistance patterns of three principal organisms of neonatal sepsis isolated from inborn neonates (NNPD network, 2000)[13]

	S. aureus		*E. coli*		*Klebsiella spp*	
	Strains tested (No)	Resistant strains (%)	Strains tested (No)	Resistant strains(%)	Strains tested(No)	Resistant strains(%)
Ampicillin	48	92	51	86	78	96
Cloxacillin	77	75	19	100	57	96
Gentamicin	65	63	75	60	173	79
Amikacin	52	52	40	37	174	36
Ceftizoxime	17	59	12	50	21	52
Cefotaxime	62	41	72	53	235	60
Ceftrioxone	18	39	26	35	93	39
Cefaperazone	11	54	5	80	26	61
Ceftazidime	9	67	21	57	55	74
Piperacillin	9	56	18	83	34	56
Vancomycin	23	26	14	93	17	76
Ciprofloxacin	83	52	64	44	187	27

There has been no study on the sensitivity pattern of bacteria prevalent in the community. However, there are some indicators that suggest that antibiotic resistance levels may not be to the extent seen in hospital-based studies. Bang et al. showed that organisms isolated from high vaginal swabs taken from women in rural areas of Maharashtra were sensitive to simple drugs like erythromycin (53 percent), ampicillin (87.5 percent), chloramphenicol (86 percent), cotrimoxazole (94 percent), and gentamicin (95 percent).[3,18]

Prevention of Sepsis in Hospital Settings

Measures that led to a decrease in the NNS rate – resulting a decrease in neonatal mortality in hospital settings – were reported in two studies.[10,19] In a tertiary care hospital setting, reducing nursery occupancy, meticulous adherence to asepsis routines, and breastfeeding resulted in a significant decline in the incidence of NNS.[19]

In the other study, infants were managed mainly in the postnatal wards, where health providers reinforced an emphasis on maternal involvement through daily counseling.[10] There was a significant reduction in the overall NMR (from 83 to 43 per 1,000 live births). The mortality rate in preterm and LBW infants decreased by 40-50 percent. The most significant reduction was observed in deaths due to infection, which decreased from 2.5 percent to 0.9 percent of live births in the study year.

Management of Sepsis in Home and Facility Settings

In a community-based randomized trial in rural Haryana, LBW neonates with acute respiratory tract infections (ARI) were managed using oral penicillin for five days by primary health care workers.[20] The ARI was diagnosed by clinical criteria. The case fatality rate of moderate to severe ARI in LBW infants decreased significantly in the intervention area (8.7 vs. 24. 6 per 100 episodes in the control area). There was also improved care-seeking in the intervention villages.

In a field trial in rural Maharashtra, VHWs and TBAs were trained to diagnose neonatal and childhood pneumonia and to treat with oral cotrimoxazole.[21] Over a period of three and a half years, the CFR declined from 13.5 percent to 0.9 percent, and a 40 percent reduction in pneumonia-related mortality in neonates was also reported. A later study in the same area tested the effect of home-based management (by village heath

workers) of neonates with sepsis, using oral cotrimoxazole and intramuscular gentamicin.[3] The CFR of NNS declined from 16.6 percent to 2.8 percent in the intervention villages. Sepsis-related mortality declined from 27.5 to 6.6 per 1,000 live births.

Conclusion

NNS is a major cause of neonatal ill health and mortality. There is a lack of community-based studies defining causative organisms, but it appears that *Klebsiella spp*, *Staphylococcus aureus*, and *Escherichia coli* are the three most important bacteria. The emergence of antimicrobial resistance among sepsis-causing strains in hospitals is a cause of serious concern.

Perinatal asphyxia

Perinatal asphyxia (PA) is one of the major problems that must be addressed in order to improve newborn survival in India. Of the estimated 1.2 million annual neonatal deaths in the country, between 300,000 - 350,000 may be due to PA.[1,2] In addition, 100,000 -150,000 stillbirths each year are estimated to be due to intrapartum hypoxia, and an unknown number of survivors of asphyxia may develop long-term neurological disability.[1,3] In spite of advances in neonatal care, deaths due to asphyxia have remained relatively unchanged over the last several years.[2,4]

The Burden

Intrapartum stillbirths, asphyxia-related neonatal deaths, and asphyxia-related disabilities reflect the range of outcomes of PA. Reliable data for these entities in the community do not exist, in part because of the wide variety of confusing and inconsistent definitions in use for perinatal asphyxia. The NNF of India defines asphyxia for community settings as the "absence of cry at one minute."[5] A combination of cry, color, and activity was found to have a good correlation with cord blood pH and a one-minute Apgar score in a hospital-based study.[6] Neonatal encephalopathy as a marker of PA is too complex to be reliably measured at the community level, although some attempts have been made to simplify it by reducing the number of clinical markers.[7]

The incidence of severe BA (defined as absent or inadequate breathing at five minutes) was 4.6 percent, with a CFR of 38.5 percent in villages of Maharashtra.[8] In an ICMR multicenter study, in 16.2 percent of total births in urban slums and in 11.8 percent of total rural births, infants did not cry immediately after birth.[9] About 6.7 percent of the rural and 2.5 percent of the urban infants showed abnormal color (blue or pale).[9] In a survey of 54 villages in Haryana, the prevalence of definite asphyxia was 2 percent of births, with a CFR of 74 percent.[10] A comparable prevalence of 2.1 percent was reported from rural Maharashtra.[11] Nearly one-fourth of early neonatal deaths in the hilly regions of Himachal Pradesh were attributable to asphyxia.[12] In a report from Maharashtra, 53 percent of SBs were due to definite asphyxia.[15] A hospital-based study from Ahmedabad ascribed 29 percent of SB to intrapartum asphyxia.[16]

From the largest hospital-based study by the NNPD network, severe asphyxia (Apgar 0-3 at 1 min) in 2.4 percent and moderate asphyxia (Apgar 4-6 at 1 min) in another 6.6 percent was reported in a cohort of 49,664 inborn infants during 2000.[2] A total of 1.4 percent of infants developed hypoxic encephalopathy. PA accounted for 19.9 percent of all neonatal deaths[2] and was the most common cause of stillbirths (32.8 percent) during the same time period.[2] There was a decrease (since 1995) of around 40 percent in the incidence of asphyxia during the year 2000 at ten networking centers.[2]

Risk Factors

A case-control study in rural Haryana identified prematurity (Odds ratio, OR 55.3, 95 percent; CI 12-249), LBW (OR ,13.8, 95% CI 3.2-55.6), and primigravida status (OR 2.7, 95 percent; CI 1.2-6.3) as major risk factors associated with asphyxia.[17] The use of oxytocin to induce labor without adequate monitoring (OR 4.0- 9.09, 95 percent; CI 3.3-24.8) and a lack of ANC have been reported as the risk factors in other studies.[13-15]

Room Air Resuscitation Studies

A study in Delhi demonstrated efficacy of room air as an alternative to oxygen for resuscitation.[18] Later, a multicenter quasi-randomized controlled trial in India confirmed that asphyxiated infants can be managed as effectively using room air as 100 percent oxygen.[19] This study enrolled 431 infants at four tertiary care centers. It showed that there was no difference between the two groups in asphyxia-related mortality, the proportion of infants developing hypoxic-ischemic encephalopathy within seven days, the time to first breath, and the median Apgar score at five and ten minutes. In fact, the time to first cry and the duration of resuscitation were shorter in the room air group infants.

Similar results have been reported after an international multicenter trial conducted in six countries including India.[20] Follow-up of these infants up to 18-24 months of age did not reveal any difference in somatic growth or neurological handicap in the two treatment groups.[21]

Resuscitation Protocols and Post-resuscitation Management

There are no clear guidelines or evidence to manage certain situations such as that of meconium-stained liquor or shock in the community. The time of initiation of resuscitation is also based on practice and not research. Another area for research involves managing neonates following resuscitation. Potential therapies to reduce brain damage among asphyxiated neonates need to be explored, and for this the early and reliable identification of asphyxia is crucial. Phenobarbital has shown some promise in this regard in a small hospital-based trial.[22]

Community-based Studies for Reducing Asphyxia-related Morbidity and Mortality

Traditional birth attendants and community health workers

Kumar tested the feasibility of training TBAs to manage asphyxia using mucous-sucker and bag-and-mask ventilation in domiciliary deliveries in the Raipur Rani block of Haryana.[23] These trained TBAs successfully used the resuscitation equipment in eligible infants. The prevalence of asphyxia was 0.9 percent among infants delivered by trained TBAs as compared to 2.4 percent in infants delivered by conventional TBAs. The asphyxia-specific mortality was 70 percent less among infants delivered by trained TBAs.

In Gadchiroli, a package of neonatal services provided by VHWs included management of asphyxiated infants.[24] VHWs managed these cases by clearing airways using a mucous sucker, providing tactile stimulation, and giving artificial breaths by mouth to mask or by tube and mask, if needed. This intervention led to 75 percent reduction in asphyxia-specific mortality.[25]

Both the study in Haryana and the study in Gadchiroli took place in settings that ensured extremely high levels of supervisory and training support – conditions that are not easy to replicate in operational settings.

Resuscitation equipment

The effective use of bag and mask can be taught to TBAs.[23] Currently, bag and mask devices have become relatively inexpensive and are under mass production. When the costs were high, simpler devices like tube and mask had been explored as alternatives. In a two-center pilot trial involving Tanzania and India, tube and mask was found to be effective in resuscitation but was very uncomfortable to use.[25] The resuscitators could not deliver more than 20 breaths per minute; in addition, a safety valve could not be incorporated into the device.

Hypothermia

The Burden

Hypothermia is a common problem among neonates, especially those who are LBW. Since almost two-thirds of all neonates are born at home, a reliable estimate of this problem is not available in India. A prospective study conducted within 24 hours of birth among villages in Haryana found the incidence of hypothermia to be 11.1 percent.[1] The risk of hypothermia was higher in the winter months (19.1 percent) as compared to

summer months (3.1 percent). Another study, in rural Maharashtra, reported significant hypothermia (<95 °F) in 17 percent of neonates.[2] Sicker infants being referred for advanced neonatal care are at higher risk of hypothermia. A hospital-based study on outborn-referred neonates in north India has documented hypothermia to be present in 54 percent of neonates at admission.[3] This incidence was higher (80 percent) among referred infants born at a gestation of less than 30 weeks. Hypothermia has been recognized as an important morbidity, even among inborn deliveries. A study in Shimla reported an incidence of 2.9 percent, with a higher incidence among LBW infants (8.4 percent).[4]

Knowledge and Practices Associated with Hypothermia

The newborn infant is at a higher risk of hypothermia due to a variety of traditional practices. According to the study by Kumar et al. conducted in rural Haryana, almost 25 percent of delivery rooms did not have a heating source to increase the ambient temperature in winter.[1] More than 40 percent of infants were reportedly not wiped dry after birth, and 65 percent were bathed within 24 hours of delivery. A multicenter study conducted in seven countries including India showed that thermal control practices were frequently inadequate in the following areas: ensuring a warm environment at the time of delivery, initiation of breastfeeding and contact with the mother, bathing, checking the infant's temperature, extra care of LBW infants and care during transport.[5]

Another study conducted among 69 TBAs in Haryana showed that only 1.3 percent of the TBAs were aware of the risk of hypothermia to newborn infants.[6]

Hypothermia and Neonatal Mortality

Although it is likely that hypothermia contributes to neonatal mortality in the community, little data is available. In one study from rural Maharashtra, hypothermia was associated with a CFR of 15.4 percent.[2] Hospital-based data on outborn neonates being referred for advanced neonatal care have also shown adverse outcomes in the presence of hypothermia at admission. One study saw a fatal outcome in 69 percent of infants with hypothermia as compared to 38 percent of infants admitted without hypothermia.[3] Hypothermia is an important cause of mortality among inborn neonates and was responsible for 9.6 percent of deaths in one hospital-based study.[7]

Measurement of Temperature

Rectal or aural temperature has been considered the gold standard for measuring core temperature, although there are obvious limitations to these procedures. Rekha et al. in a hospital-based study found a positive correlation between rectal and axillary temperatures in neonates admitted to a neonatal unit.[8] In another hospital-based study, the use of hand touch was evaluated to assess hypothermia in neonates.[9] The study found positive correlation between temperatures as perceived by touch by a trained neonatologist and measurements taken with an electronic thermometer.[9] In this study, the health professionals correctly picked out all the hypothermic infants. However, in a similar study conducted in rural Haryana, untrained mothers and field workers were unable to diagnose moderate hypothermia (temperature less than 36 °C) in 53 percent and 43 percent of newborns, respectively.[10] These findings suggest that appropriate training would be needed to enable mothers, TBAs, and field workers to reliably diagnose hypothermia in neonates using human touch.

Interventions for Hypothermia

Maintenance of normal temperature is an important determinant of survival and well-being in all neonates. Simple preventive interventions can avert hypothermia. Creating awareness among primary health care givers about this important morbidity is essential to tackle this problem. In a study from rural Maharashtra, VHWs trained in neonatal care made home visits and managed BA, LBW infants, hypothermia, and breastfeeding problems.[11]

Modern radiant warmers and incubators, which warm only one infant at a time, are expensive and difficult to maintain. Creating a higher ambient temperature in rooms meant for the care of 3-4 newborn infants may be a cheaper alternative. A "warm room or cubicle" is one that is set apart and kept sufficiently heated to meet the needs of hypothermic and LBW infants. Experience in India has shown that these warm rooms are an effective means of preventing hypothermia in sick and preterm neonates.[12] Graded warm rooms can successfully meet the thermal needs of infants with different BWs. A room temperature of 34-35.5 °C for infants weighing 1-1.5 kg, 32-34 °C for infants weighing 1.5-2.0 kg, and a room temperature of 28-30 °C for infants weighing more than 2.5 kg have been recommended.[13,14] Solar energy can also heat these rooms sufficiently, especially in rural areas without electricity. Using solar-powered room heating to maintain infant temperature has been shown to be equally efficacious and cost-effective as more sophisticated warming devices.[15]

Oil application, a common traditional practice, has been studied for prevention of hypothermia in preterm neonates. One controlled study found that applying corn oil on the entire body every four hours is associated with a lesser need for radiant warmers for prevention of hypothermia in preterm neonates.[16]

Another common problem with hypothermia is encountered during the transport of sick neonates for advanced neonatal care. Innovative and cheap alternatives may be required to solve this problem. A portable, cheap, and indigenous incubator made of polystyrene has been shown to maintain the temperature of naked and clothed infants placed inside it for a two-hour period.[17]

Kangaroo Mother Care (KMC)

Another intervention that has been found to be useful, especially in the care of LBW infants, is KMC or skin-to-skin contact. The use of this modality was associated with the following benefits: better weight gain in the immediate neonatal period, exclusive breastfeeding for longer periods, reduced risk of nosocomial infections at 41 weeks, and decreased risk of severe illness in the first year of life.[18]

In India, three centers have conducted feasibility studies and introduced KMC in their units. Experience with this modality in Ahmedabad has shown significant improvement in weight gain among LBW infants without any increase in mortality and morbidity, including sepsis and hypothermia.[19] This method was found to be culturally acceptable by the mothers and the health personnel in the unit.

A randomized controlled trial conducted in Delhi has shown better weight gain and earlier discharge by one week in neonates receiving KMC.[20] This study found beneficial effects in thermo-regulation with the use of KMC in very LBW infants. Breastfeeding rates were also significantly higher (86 percent vs. 43 percent) in the group receiving KMC as compared to the control group. The procedure was found to be culturally and technically acceptable to mothers and the health personnel in the unit. In another trial, a KMC bag (fabricated using local clothing) was used to facilitate round-the-clock KMC practice.[21] This trial showed KMC to be effective in reducing pain secondary to venepunctures.

This modality has recently been tried in a hospital setting after the initial stabilization of sick neonates, but its efficacy in the community, where facilities for initial neonatal care and referral are often unavailable, remains to be evaluated.

Saving Newborn Lives (SNL)/Save the Children is promoting KMC in India. This initiative involves organizing workshops at various places for training healthcare providers, and assisting in developing KMC demonstration sites at teaching hospitals in India.

Neonatal jaundice

Almost two-thirds of infants develop jaundice on the second or third day of life, which settles by 7-10 days in the majority of infants. However, a small proportion of infants develop significant jaundice

(hyperbilirubinemia) requiring interventions such as phototherapy and exchange transfusion. In the absence of timely treatment, significant jaundice can result in bilirubin induced neurological damage (BIND) and long-term neurological disability.

Magnitude of the Problem

Hospital-based studies

The NNPD network reported the incidence of neonatal jaundice at 6.1 percent in inborn infants and 27.9 percent among outborn admissions.[1] Phototherapy was required in 4.8 percent of the inborn and 34.9 percent of outborn infants admitted for care. Exchange blood transfusion was needed in 0.5 percent of inborn and 7 percent of outborn infants. Various other hospital-based studies have estimated the incidence at 2-10 percent among neonates.[2-7] A decline with time in incidence of hyperbilirubinemia was demonstrated in a special care unit of a teaching hospital in a retrospective study.[8] The authors attributed the decline in hyperbilirubinemia to improved neonatal care practices, such as providing warmth, the early institution of breast milk feeds, and better care in the labor room

Common causes of hyperbilirubinemia in India include blood group incompatibilities, glucose-6-phosphate dehydrogenase (G6PD) deficiency, prematurity, and LBW.[2-15] Rh isoimmunization continues to be a significant problem, resulting in death or disability in many of the affected newborns.

G6PD deficiency is common in India and may manifest as hyperbilirubinemia. The WHO Working Group estimated that 7 to 9.9 percent of the male population in India is homozygous for G6PD deficiency.[15] Higher incidence was reported in Parsees and Bhanushalis. G6PD deficiency was present in 3 to 33 percent of cases of hyperbilirubinemia in various reports.[2-15] Hyperbilirubinemia secondary to G6PD deficiency generally manifests after 24 hours and does not exhibit hemolytic features on investigation. However, high incidence of bilirubin encephalopathy was reported in affected infants.[12]

Risk factors for developing high levels of jaundice include prematurity, LBW, blood group incompatibility, breast feeding, NNS, and red cell enzyme deficiencies like G6PD.[2-5] Jaundice as a presenting feature of sepsis was reported in a few infants. In one study, even though urinary iodine excretion (a marker of iodine deficiency) was lower in infants with hyperbilirubinemia compared to those without it, no difference was noted in thyroid hormone levels, thus eliminating hypothyroidism as a major causal factor in neonatal hyperbilirubinemia.[16]

Community-based studies

There is very limited data from community-based studies on neonatal hyperbilirubinemia. Abnormal jaundice was reported in 1.7% percent of neonates in the Gadchiroli cohort.[17] The ICMR multicenter study reported neonatal jaundice in 1.6 percent of neonates in rural and urban slum settings.[18]

Neonatal Jaundice and Bilirubin-induced Brain Damage

BIND continues to be a significant problem. Referral of infants with hyperbilirubinemia to hospitals is often late, by which time high levels of serum bilirubin and a high probability of impending or existing brain damage have already set in.[12,19-20] Many of these newborns have nonhemolytic hyperbilirubinemia. The American Academy of Pediatrics (AAP) recommends a cut-off for exchange transfusion at a total serum bilirubin (TSB) of 25-29 mg/dl in term infants without hemolysis.[21] However, 9.8 percent of infants with TSB of 20-25 mg/dl had kernicterus in one study from Chandigarh.[19] In a later report from the same center, the incidence of BIND was 14 percent in infants with TSB of < 25 mg/dL and 18 percent in infants with a TSB of 25-29 mg/dL.[20] On multiple regression analysis, BA, free bilirubin, and maximum TSB levels emerged as significant predictors of BIND.[20] These studies suggest that the risk of BIND is high in infants with persistent TSB >18-20 mg/dl, even when these infants are full term and the jaundice is nonhemolytic. There is a need to redefine cut-off values for the exchange transfusion in these infants.

Neonatal jaundice is a significant risk factor for cerebral palsy and mental health disorders.[22,23] Studies showed that auditory brainstem response was abnormal in a significant proportion of infants with hyperbilirubinemia, and these abnormalities were reversed by exchange blood transfusion.[24,25] All these infants were normal neurologically at follow-up at one year of age.[24-25]

Early Discharge and Hyperbilirubinemia

Early discharge (within 24-48 hours) after birth is commonplace in many hospitals because of a paucity of beds. Since breastfeeding may not be well established and infants have not had their peak TSB by then, early discharge may be an important risk factor for significant hyperbilirubinemia. Early reporting of excessive jaundice and a routine follow-up visits to these infants after 2-3 days to detect feeding problems and significant jaundice is simply not feasible in India. Studies have been conducted for the early identification of infants at risk of developing hyperbilirubinemia. In a hospital-based study, TSB of less than 6 mg/dL at 24±6 hours of age identified infants at low risk of subsequent hyperbilirubinemia.[26] Cord TSB levels of 2.5 mg/dL or more has also been identified as a predictor of subsequent hyperbilirubinemia in ABO-incompatibility as well as normal settings.[27] Another study proposed a TSB cut-off of 3.99 mg/dL for this purpose.[28]

Assessment of Jaundice

As a substitute for TSB estimation, various assessment methods have been evaluated. Percutaneus icterogram, designed using a perspex sheet with stripes of yellow color of different intensities, was reported to correlate well with TSB in two studies.[29-30] Multispectrum photospectrometry (BiliCheck™) on body parts was tested in one study; it showed a good correlation with serum bilirubin levels only for lower values of TSB.[31] Reflectance photometry performed on a filter paper soaked with a drop of serum was shown to have a better correlation with TSB than when it was performed directly on the skin.[32] A plasma color index, comprised of a naked eye comparison of the color of plasma with that of different dilutions of potassium dichromate solution, has also been evaluated for this purpose.[33-34]

Management of Hyperbilirubinemia

Phototherapy remains the cornerstone of treatment of hyperbilirubinemia in most cases. However, no specific guidelines for phototherapy and exchange transfusion are available for the country. Phototherapy equipment was reported to be in a dismal state in 24 neonatal units of referral hospitals and small and large nursing homes.[35-36] Only a third of the phototherapy units were found to be in optimal condition, and the use of blue light phototherapy was infrequent.

Prophylactic phenobarbitone was used with variable effects in VLBW infants and in "at risk" term infants to decrease the incidence of hyperbilirubinemia.[37-39] In one study, a high dose of intravenous immunoglobulin given early in the management of Rh isoimmunized cases was helpful in decreasing the severity of jaundice.[40] The use of exchange blood transfusion (EBT) is quite common in clinical practice in India in the absence of adequate phototherapy lights and because of the late presentation of infants.[1] The transmission of blood-borne infections was reported with EBT despite the use of screened blood .[41]

Conclusion

Neonatal jaundice is a common and benign condition in most neonates. In some, however, it may progress to a significant level with the potential to cause brain damage. Timely intervention can prevent permanent neurological sequelae. Health personnel should be trained to diagnose this condition early for prompt action. Evidence-based guidelines for cut-off levels to start phototherapy and EBT need to be evolved for our neonates. An attempt should be made to allay fears and remove myths that prevail in the society about jaundice.

Congenital malformations

Congenital malformations are an important cause of newborn mortality, accounting for 10 percent of neonatal deaths globally.[1]

The incidence of congenital malformations at birth from community-based studies in rural areas of India is variously reported as 0.8 percent[2], 1.0 percent[3] and 1.3 percent.[4] Two large multicenter hospital-based studies estimated the incidence of congenital malformations to be around two percent (Table 3.5).[5,6]

Table 3.5 Incidence and types of major congenital malformations at birth in the NNPD and BARC studies

Variables	NNPD 2000[5]	BARC 1993 - 97[6]
No. of centers	16	6
No. of births covered	49964	94610
Incidence	2.0%	2.0%
Common malformations		
• Cardiac	0.4%	0.14%
• CNS	0.3%	0.6%
• Musculo-skeletal system	0.3%	0.5%
• Gastro-intestinal	0.2%	0.4%
• Down syndrome	1:1785 live births	1:1139 births

NNPD network reported malformations among live births whereas BARC study reported these among live and stillbirths combined.

The most common malformations found in the NNPD study were those of the cardiac system, while neural tube defects (0.4 percent) predominated in the Bahbha Atomic Research Centre (BARC) study; the incidence of neural tube defects was 0.2 percent in the NNPD study. Malformations accounted for 7.1 percent of all neonatal deaths and 10.9 percent of all SBs among inborns in the NNPD study during 2000.

The incidence of neural tube defects is reported to be much higher in north than in south India.[7] The Sikh community has the highest incidence of neural tube defects, and this excess risk persists when they migrate to Western countries such as the United Kingdom.[7]

India was the first country in the world to legislate a Medical Termination of Pregnancy Act, under which a fetus with a life-threatening congenital malformation can be legally aborted. Despite this act, there is no data on such abortions at the national level. The available indicators of coverage of ANC and the figures of congenitally malformed neonates being born seem to suggest that the rate of antenatal detection of major congenital anomalies is too low to make a dent in the neonatal deaths caused by congenital malformations.

Salient Community-Based Studies on the Delivery of Newborn Health Intervention Packages

Risk-approach strategy (Pune study)

The risk-approach strategy envisages some care to all individuals in the target group and extra care to those at risk. This approach involves identifying risk factors relevant to the local situation, screening the population for individuals at risk, and providing them with extra care in proportion to their needs according to a risk-based management plan.

In an uncontrolled study by Pratinidhi et al. in 22 villages with a population of 47,000, in Sirur near Pune, trained community health guides (CHGs) identified HR newborns within 48 hours of delivery at home.[1] Follow-up visits were made on days 8 and 29. The 40 CHGs were local, resident women with 4 to 11 years

of schooling and included 12 TBAs. High-risk neonates included LBW babies, preterms, or those with feeding problems, a history of prolonged or difficult labor, or neonatal illness. A field medical officer supervised the management of these HR neonates. The management plan consisted of domiciliary care or referral depending on the number of risk factors and the severity of illness. Domiciliary management of LBW infants included increasing room temperature and maintaining humidity by traditional methods, advising mothers on wrapping the infant in several folds of clean cotton saree, minimal handling and isolation of the infant to avoid infection, and advising frequent breastfeeding. With this approach, the NMR (per 1,000 live births) dropped from 51.9 in 1981 to 38.8 in 1982.

Although experience is limited, available data seem to suggest that it is feasible to deliver specific interventions for HR neonates effectively in the primary care setting. For this approach to be effective, relevant risks have to be assessed in the community itself by village-based workers.

Domiciliary neonatal care (Dahanu study)

In 1987-1990, Daga and colleagues tested a model of domiciliary neonatal care by a TBA with referral services provided by a PHC and a CHC in Dahanu taluka of the Thane district of Maharashtra.[2]

A medical officer and other paramedical workers (e.g., a lady health visitor (LHV), an ANM) of the Ganjad PHC of Dahanu taluka were trained at a medical college hospital in various aspects of neonatal care including labor room care, resuscitation, thermal control, oxygen administration, transport, and management of HR and LBW infants.

The paramedical workers then trained the TBAs of the area who were the final care providers. These TBAs provided ANC, conducted deliveries, ensured postnatal care of neonates, and administered mouth-to-mouth resuscitation to asphyxiated infants. The mother's role in the care of newborn was stressed. TBAs used foot-length measurements to identify very LBW infants (less than 6.5cm corresponded to a BW of 1,500-1,600 gm and gestation of around 34 weeks). The small and sick neonates identified by TBAs were taken to the PHC where they were initially stabilized and then referred to the community hospital as needed.

During the last year of intervention, there was a significant decline in the PMR (from 74.7 per 1,000 births during 1987 to 57.1 during 1990) and in the NMR (from 33.6 per 1,000 live births during 1987 to 28.7 during 1990), and there was an increase in the antenatal registration rate. Mouth-to-mouth resuscitation was able to resuscitate 8 out of 10 asphyxiated newborns. Only 0.5 percent of neonates required referral to a community hospital, and 80 percent survived.

Care of LBW infants in a rural community (Ambala study)

Datta et al. studied the health problems of LBW infants during the first year of life and the feasibility of implementing a specific intervention package likely to reduce morbidity and mortality and enhance growth in two community development blocks of Haryana.[3] Primary health care workers and government functionaries were trained in various aspects of neonatal and infant care, with special emphasis on managing LBW and of common morbidities such as diarrhea and respiratory infection. The study included 970 newborns in 16 control villages and 1061 newborns in 19 intervention villages.

The package of services included TT immunization of pregnant women, delivery of infants using a clean delivery kit, promotion of breastfeeding, and home visits. For the first time in a community setting, oral penicillin for five days for treatment of moderate to severe ARI was used.[4] Diagnosis and severity assessment of ARI was based entirely on clinical criteria.

The LBW rate was 34 percent in control and 22.8 percent in intervention villages. The study followed infants to one year of age. LBW infants had a significantly higher IMR compared to NBW infants (243 versus 33 per 1,000 live births). There was no significant difference in illness rates in LBW and NBW infants, but case

fatality of all types of illness was higher in LBW compared to NBW infants. The intervention resulted in a 42-percent reduction in the IMR in LBW infants, with an even greater reduction in the post-neonatal mortality rate (60 percent) than in the NMR (30 percent). Treatment of ARIs in LBW infants with penicillin resulted in a significant decline in the CFR (8.7 per 100 episodes in intervention areas versus 24.6 per 100 episodes in control areas). In addition, improved care seeking was noted in intervention areas compared to control areas. The duration and severity of morbidities were lower in intervention areas, and enhanced growth of LBW infants was noted. The study noted positive changes in infant care practices, as well as in care seeking behavior, as a result of the intervention.

Home-based neonatal care (Gadchiroli study)

In Gadchiroli district, about 1,000 kilometers from the state capital, Mumbai, SEARCH has developed a remarkable model of home-based neonatal care which, in a controlled trial, showed significant reduction in neonatal and infant mortality in the villages of this poor, remote area.[5]

SEARCH had introduced community-based management of pneumonia in children in 1988 with excellent results.[6] By 1992, the team realized that of the residual IMR of 80 per 1,000 live births, neonatal mortality contributed 75 percent. Recognizing that hospital-based care for sick newborns was not possible in their community, SEARCH conceived the innovative idea of home-based newborn health care. Care had to be home-based because 83 percent of births in rural India occurred at home,[7] more than 90 percent of parents were unwilling to go to hospital for treatment of a sick newborn,[8] local doctors were not trained to manage sick neonates, and hospital care was inaccessible to and too costly for most rural communities.

The SEARCH study began by collecting baseline data for two years (1993-1995) from 39 intervention villages and 47 control villages. The baseline NMR was 62 and 58 respectively.[1] One year of observing neonates in their homes provided the first estimates of morbidities in rural neonates. While 54 percent of neonates needed medical attention, only 2.6 percent received it, and only 0.4 percent were hospitalized.[5] The research team then introduced home-based neonatal care in the intervention villages (1995-1998) and monitored mortality rates in both the control and intervention villages.

The key providers of neonatal health care in SEARCH's model are women from the community —mothers and grandmother — supported by trained VHWs and TBAs (Table 3.6). The VHWs visit each woman three times during her pregnancy, provide health education, and visit 8 to 12 times during the postnatal period to help the mother look after the neonate. The VHWs are trained to resuscitate asphyxiated infants, support breastfeeding and maintenance of body temperature, and recognize and treat sepsis/pneumonia using two antibiotics. They also provide care at home to HR neonates such as preterm or LBW infants.

TBAs receive training and are supplied with clean delivery kits as well as IFA and calcium tablets and ointment for neonatal conjunctivitis. VHWs and TBAs work in collaboration. The VHWs are paid honorarium linked to their workload and performance.

By 1998, the third year of the intervention, 93 percent of newborns in the intervention area were receiving home-based care. The vital statistics surveillance system of SEARCH was able to record 98 percent of births and child deaths in the area. While the NMR in the control area remained at around 60 per 1,000 live births, the NMR in the intervention area dropped from 62 to 25 per 1,000 live births — a 62 percent reduction compared to the control area. The IMR also reduced by nearly half to 39 (Table 3.6). In 1999, a FRU was added where selected HR neonates were kept in a room with a heater, and tube feeding was provided when necessary. This further decreased the IMR to 30.

Table 3.6 The effect of home-based neonatal care (Gadchiroli, 1993-98)

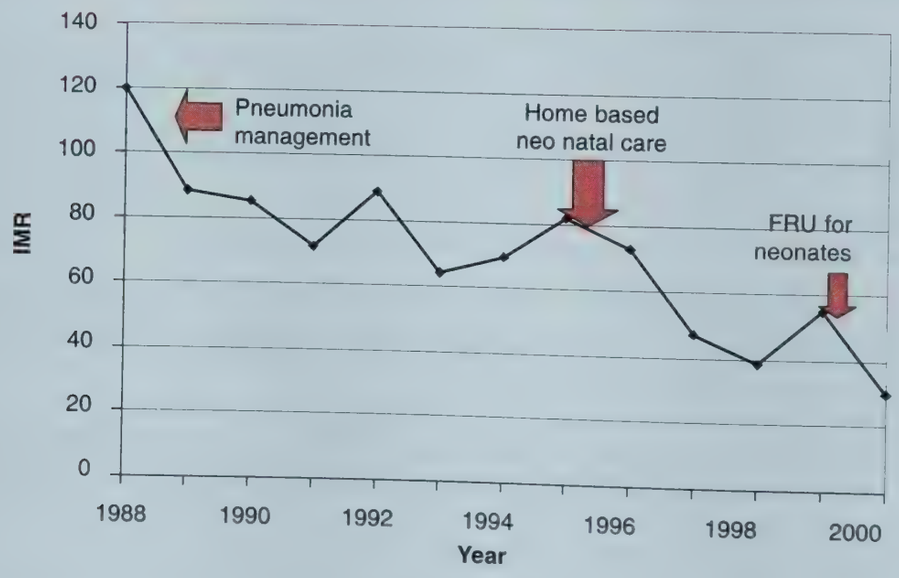
Rate (per 1000 live births)	Control area		Intervention area		Reduction
	Baseline (1993-95)	Intervention year 3 (1997-98)	Baseline (1993-95)	Intervention year 3 (1997-98)	
NMR	58	60	62	26	62%
IMR	77	75	76	39	46%

The other major findings of the study were:

- Beliefs and behaviors of mothers regarding newborn care changed significantly;
- The incidence of various neonatal morbidities (especially infections, breastfeeding problems, hypothermia, and mild BA) declined overall by 49 percent;
- Case fatality dropped steeply in preterm LBW infants by nearly 60 percent as well as in the neonates treated for sepsis/pneumonia;
- Maternal morbidities during labor and the postpartum period declined significantly, thereby establishing the feasibility of combining home-based postpartum care of mothers with newborn care.

In 1999, first level referral care unit (FRU) was added where selected high-risk neonates were kept in a room with a heater, and tube feeding provided when necessary. This further decreased the IMR to 30. The total effect of this approach on the IMR is shown in Figure 3.4.

Figure 3.4 The effect of interventions on the IMR (39 villages in Gadchiroli, 1988-2000)



Based on these remarkable results, the Ankur project has been launched by SEARCH in collaboration with seven local NGOs and with financial support from Save the Children's Saving Newborn Lives Initiative. The aim is to examine the potential of replicating this successful model in other communities in Maharashtra state as a prelude to scaling up in other regions of India. The seven project sites include urban and tribal communities as well as rural populations (Figure 3.5).

Figure 3.5 Project Ankur

The Ankur project began in 2001. Baseline mortality rates were collected, and then the VHWs were selected. An outstanding feature of the Ankur project was the staged participatory training program for VHWs, TBAs, and their trainer — a process that has produced capable and confident VHWs. These VHWs scored 86 percent marks on an average in the final training evaluation. Their skills have been recognized and their communities now request their services. This rapid community acceptance of the VHWs and home-based neonatal care in the NGO study sites was impressive. SEARCH and Saving Newborn Lives, in a mid-term evaluation in March 2003, were able to conclude that the Ankur project, at least in its preliminary stage, has shown that home-based neonatal care can be replicated by other NGOs.

The Government of India has initiated a pilot study that is being conducted by the ICMR in five states to test whether the Ankur model can be replicated for incorporation into a national program.

4 Newborn Care Practices and Care Seeking

Traditional Maternal-Neonatal Care Practices

Traditional neonatal health care practices can be defined as age-old family practices and beliefs about the care of newborn infants, which have evolved over generations. Often the intent is healthy, but the consequences may be unbeneficial, inconsequential, or even harmful. Practices during the neonatal period are determined by elders in the household, primarily the mothers-in-law, and are reinforced by TBAs. Many practices have their roots in the traditional Indian systems of medicine, especially Ayurveda.

It is difficult to summarize traditional neonatal health care practices that could be considered representative for the entire country. Such practices vary widely among different states, districts, and even within the same district. They vary with region, religion, caste, and tribe. Education and the socio-economic status of the family are other important determinants. There is limited published literature and scientific research in this area.

The NNF conducted a survey on traditional practices in newborn care and organized a workshop in 1991 on this issue.[1] It was recommended that healthy traditional care practices be promoted and reinforced actively. Practices that do not adversely affect neonatal health should be ignored. However, harmful practices should be discouraged through informed counseling.

The following is a glimpse of some traditional practices reported in different studies from different parts of the country.[2-19]

Mothers

Antenatal

Possibly good practices

- Expectant mother going to her parents' home for confinement and delivery
- Drinking plenty of milk so that the baby becomes fair-complexioned
- Avoiding drinks like tea and coffee
- Eating special calorie-rich food
- Practicing abstinence during pregnancy

Possibly harmful practices

- Considering pregnancy to be a "normal process" and thus not seeking medical care
- Starving the mother in late pregnancy, so that the baby is small at delivery and the mother can deliver the baby with ease
- Withholding certain nutritious foods like bananas, potatoes, eggs, and fish

- Continuing to do heavy physical work at home or outside
- Not accepting iron tablets (which are often dark red or black in color) for fear of having a dark-complexioned baby

Intranatal

Possibly good practices

- Preparing a clean and isolated place in the house for delivery
- Warming the room where the delivery takes place

Possibly harmful practices

- Conducting the delivery in a dark and ill-ventilated room such as an outbuilding meant for livestock
- Delivery at home by an unskilled birth attendant or an elderly relative
- Not washing hands or using dirty linen to wipe hands
- Using dirty rugs and clothes as sanitary pads
- Performing frequent vaginal examinations and applying substances like ghee to genitalia
- Inducing vomiting by crude maneuvers like putting hair into the mouth and throat of the mother to facilitate the expulsion of placenta

Postnatal

Possibly good practices

- Giving calorie-rich food like sweets containing peanuts, jaggery, and ghee to lactating mothers
- Isolating the baby and the mother in a room for six weeks
- Using binders over the abdomen

Possibly harmful practices

- Withholding "cold foods" such as banana, curd, cold milk, fish, and "gaseous food" like potato and pulses
- Resuming work in the household or on the farm soon after delivery
- Forceful isolation of the mother in an unventilated room where she is not allowed to meet anyone or not even allowed light exercise
- Applying of substances like chilies, juice of neem leaves, and cow dung to the breast to enhance lactation

Neonatal

Care at Birth

Possibly good practices

- Mouth-to-mouth breathing, if the baby is "blue" or "white"
- Using a cloth to clean the oropharynx and wipe out the secretions

Possibly harmful practices

- Holding the baby upside-down, slapping the back/trunk vigorously, and blowing into the baby's ear or making noise by banging utensils to force the baby to cry
- Cutting the cord with a used blade, or any unsterile scissors, knife, or sickle

- Application of ghee/cow dung/betel nut on the cord
- Using an unclean cloth to wipe the secretions of the baby

Postnatal

Possibly good practices

- Breastfeeding as a norm in the majority of communities
- Heating the room with "angithee" or "hot tawa"
- Massaging the baby using oil or ghee
- Wrapping the baby in several layers of clothing
- Exposing the baby to sun after massage and bath
- Putting colostrum or hind milk in the eyes to prevent conjunctivitis

Possibly harmful practices

- Practicing gender bias in favor of males and sub-optimal care of female neonates
- Bathing the baby soon after birth
- Discarding colostrum
- Giving prelacteal feeds such as honey, "janam ghutti" or tea
- Delaying the initiation of breastfeeding by hours to days after birth, linking it to some specific event (for example, the appearance of a star, the arrival of a sister-in-law who cleans the breast)
- Continuing use of water, tea, or "ghutti" to breastfeed babies
- Putting oil in the baby's nose or ears to clean them
- Using witchcraft like "jhar-phoonk" for neonatal illnesses
- Using eye-liner or "surma" or "kajal" on eyelashes to prevent "evil eye"
- Feeding opium for diarrhea or to sedate the baby
- Keeping a knife under the pillow of the baby

Inconsequential practices

- Piercing the ears or nose of the baby
- Massaging anterior fontanelle
- Using of old clothes for newborns until a traditional ceremony is performed
- Performing rituals to prevent poor health; commonly the application of "kala tikka" behind ears or on the forehead, "Nazar utarna" after the baby is profusely praised by relatives, the use of amulets or "tabij" given by "fakirs," and tying a black thread over the waist
- Avoiding the exposure of pregnant women and neonates to a lunar or solar eclipse
- Using homemade preparations believed to enhance lactation, like "sheera" (made from cereals, jaggery, ghee, and milk), garlic, and ginger

Prevalence of practices

An ICMR study in the 1980s examined early newborn care practices in three rural and three urban slum communities.[20] There are distinct rural-urban differences in some key behaviors (Table 4.1).

Table 4.1 Newborn care practices[20]

Domain	Practice	Urban neonates		Rural neonates	
		n	Affected	n	Affected
Cord care	*Cutting*	2035		2698	
	Scissors		91.2%		45.5%
	Knife		2.2%		2.0%
	Blade		6.0%		49.3%
	Other		0.4%		2.8%
	Tie	2049		2723	
	Rag		4.4%		7.4%
	Thread		94.5%		90.5%
	Rubber band		0.6%		0.5%
	Other		1.2%		1.5%
	Application	2030		2664	
	None		31.0%		29.7%
	Antiseptic		62.8%		15.9%
	Ghee/Haldi		4.7%		20.9%
	Ash		0.1%		21.0%
	Cow dung		0.2%		1.9%
	Other		1.0%		10.4%
Bath	*Time after birth*	1950		2623	
	0-8 hours		87.1%		31.3%
	8-24 hours		9.7%		29.3%
	2nd-3rd day		1.4%		15.6%
	After 3 days		0.3%		3.7%
	Not in first week		1.5%		19.9%
Feeding	*Age at which put on breast*	1933		2596	
	0-8 hours		41.1%		53.2%
	8-24 hours		33.1%		17.8%
	2nd or 3rd day		4.2%		20.0%
	After 3 days		0.9%		3.1%
	Never		20.6%		5.6%
	Type of first feed	1902		2572	
	Honey		9.4%		47.6%
	"Janam ghutti"		17.1%		8.9%
	Formula feed		11.9%		2.7%
	Others		39.2%		38.2%
	Not given		22.4%		2.3%

Care Seeking for Sick Neonates

Introduction

Neonates are vulnerable and fragile beings. Many of them would fall sick despite precautions and care, especially in resource-poor home settings. The early identification of serious illnesses and seeking care are key to averting adverse outcomes. However, this critical link in the pathway to intact survival is extremely weak in communities. In rural Maharashtra, for example, a study showed that less than 5 percent of newborns suffering from a major illness were taken to a provider outside the home for medical care.[1]

Care seeking for sick neonates

Families generally consult a primary care provider close to their home for their sick newborn but often do not accept referrals.[2-8]

A study reported on care-seeking practices for infants aged 0-2 months in two urban slums of Delhi where free hospital care and transportation were made available.[2] Hospital admission was advised in 273 of 2,007 (13.6 percent) cases of infants examined during the study period. Of the infants advised admission, caretakers complied only in a quarter of cases. Overall, 14 percent of caretakers felt that the infant was not

ill enough to warrant hospital admission. The main reasons (not mutually exclusive) for non-hospitalization were: no one to accompany the mother or to care for siblings (59.1 percent), deciding to wait for a response to treatment advised (28.6 percent), consulting other physicians (27.3 percent), an unpleasant past experience of the hospital (6.7 percent), trying home remedies (3.5 percent), and others (6.7 percent).

In another study by the same group, verbal autopsies were performed in infant deaths (including 43 neonatal deaths) in two urban slums to understand the processes underlying fatal outcomes.[8] Care seeking was much less common (57 percent) for illnesses resulting in death during the first week of life than those occurring later during infancy. The evolution of illness was rapid in these babies, with 61 percent of them dying within 24 hours of recognition of the illness by the mothers. Registered medical practitioners and providers trained in the indigenous systems of medicine (54 percent) were consulted more often than the trained physicians (38 percent). Private sources of care were preferred despite attendant higher expenses. Care was more commonly sought from a provider practicing within the slums (62 percent); only about 20 percent of neonates were taken to the referral hospitals. In contrast, an ethnographic study in the urban slums in Delhi suggested that care seeking for sick young infants is not limited by recognition of signs of illness; mothers do recognize the signs and often seek care outside the home.[3] This study hypothesized that though many mothers identify the illness on time, they are not able to discriminate between the many sources of care available and give preference to local unqualified practitioners.

A study conducted among newborns brought to a referral hospital in Udaipur revealed that a large proportion of mothers were aware of some of the common symptoms that suggest illness in newborns, such as a refusal to breastfeed and difficulty in breathing.[6] Most, however, did not consider these signs to be serious or life threatening. Of those who delayed coming to the hospital even after recognizing the illness, half did not perceive the illness to be serious enough to seek care earlier. A majority of the mothers had not sought care from the government (primary health care) facility before landing in the referral institution, as they often did; they did not consider the primary health care facility as appropriate for management of newborns.

The tradition and mystery surrounding pregnancy, childbirth, and local customs significantly influence the management of a sick newborn and play a major role in decisions regarding the timing and source of care seeking.[6]

Gender bias in care seeking

A strong gender bias against female neonates in care seeking was conspicuously noted across different studies.[8-11] For every two sick newborn boys admitted in hospitals, only one female neonate is admitted (Table 4.2). Of all the admitted neonates at a district hospital in Himachal Pradesh (n=86), only 30 percent were girls.[13] Female neonates formed 30 percent of total sick neonates admitted at a medical college hospital in southern Rajasthan.[10] In the largest hospital-based study of outborn neonates (n=3831) at ten leading centers of the NNPD network during 2000, the proportion of girls was only 33.2 percent.[8]

Table 4.2 Gender bias in neonatal care-seeking: far more newborn boys are admitted to facilities than girls

Settings where sick neonates were admitted	Newborn boys	Newborn girls
District Hospital Chamba, Himachal Pradesh[9](n=86)	69%	31%
Referral Hospital Udaipur, Rajasthan*(n=100)	70%	30%
10 leading centers in different cities of country[11](n=3825)	67%	33%

* Mohan P, Personal communication

A recent study analyzed verbal autopsies of the cause of death in 442 infants in the outskirts of Delhi.[11] The case fatality rate for various treatable disorders was higher in females than males. In addition, a significantly

higher proportion of "unexplained deaths" occurred amongst female infants at home compared to males. The excess of "unexplained deaths" in females, possibly due to treatable conditions, is probably a fall out of the gender bias in care seeking.

Determinants of care seeking for sick newborns

It appears that the process of decision-making for newborns differs from that of older children on several accounts. There could be factors that inhibit the prompt recognition of neonatal illness. Signs and symptoms in newborns are often subtle, and mothers may not recognize illness in the newborn in time. In addition, disease often progresses rapidly and may leave little time for parents to recognize illness, decide on care seeking, mobilize resources, and seek care.

Second, cultural beliefs influence the decision for sick newborns more than for older children. Beliefs may influence the timing of seeking care as well as the choice of provider. Because illness is often ascribed to supernatural powers, seeking care from a trained provider is often delayed. This is exemplified by a preference for traditional healers to treat measles, a disease with common supernatural connotations. Another possible contributor could be the custom of confining the mother and baby to the home for one to two months after birth. Third, the need to transport the mother who has delivered recently, along with her baby, can make seeking care logistically difficult and may deter many poor families from venturing out for treatment for their sick neonates.

There are factors concerning the availability of facilities that also influence the decision to seek care. Primary care providers generally lack confidence and competence to manage sick young infants; they are more comfortable treating older children.[7,13] This means that most of the sick young infants are referred to a higher-level hospital, which may be distant and entail high costs. For the urban slum dweller and even for the poor villager, taking his or her infant to a referral facility means the loss of a daily wage, and therefore many people do not comply with the referral advice.

Admission means a further strain on income for most poor people, particularly when both the mother and the father work as daily-wage laborers. Primary care facilities are therefore not perceived as fit for the management of sick newborns.[6] In a study in Delhi slums, it was observed that the quality of care for sick young infants was poor at the primary level across the board.[3] An evaluation of health facilities for newborn care further suggested that primary health facilities are not prepared for newborn care in terms of equipment or competence of the providers.[12]

Transport of sick neonates

Transport of a sick neonate to a facility has been far from satisfactory. Even in cities, no organized transportation system exists for this purpose. A study examined key issues concerning the transport of sick neonates (n=110) to a medical college hospital.[13] Common indications for transport were hyperbilirubinemia (35 percent), prematurity (27 percent), birth asphyxia (17 percent), and sepsis (16 percent). A significant proportion of neonates were either hypothermic (15 percent) or hyperthermic (19 percent) upon admission. Hypothermia was seen in neonates transported during the summer season also. Most babies were transported from the hospitals without any pre-transport information. The types of transport vehicles used were car (74 percent), open jeep (6 percent), and bus (5 percent). No specific measures were taken for warming the baby during transport in half of the cases. With the rest, a blanket (25 percent), cotton (25 percent), a quilt (12 percent), and a hot water bottle (8 percent) were used. A thermocol box as a substitute for transport incubators has been promoted for the transport of sick neonates.[15] Chennai has recently initiated a dedicated neonatal transport ambulance system.[16]

An interesting finding from a multi-community study in Maharashtra was the association of the distance of the village from a bus stand and NMR. The NMR for villages with a bus stand within its boundaries was 48.5 per 1,000 live births compared to 71.8 for those with a bus stand over five kilometers away.[17]

5 The Health System

The health system in India is a mix of the public and private sectors, with the NGO sector playing a small yet important role.

The Public Health System

In India the health sector is in the domain of individual states. The central government lays down policy guidelines, supplements resources, provides technical assistance, and funds and implements several national programs through the states in high priority areas. One such program is the RCH program which encompasses newborn health.

At the central level, the Ministry of Health and Family Welfare consists of the Department of Health and the Department of Family Welfare. The Department of Health looks after medical and nursing education, research, communicable diseases [such as malaria, human immunodeficiency virus (HIV), tuberculosis (TB), and guinea worm disease], noncommunicable diseases, central government health services, and drug policy. The Department of Family Welfare is responsible for FP, SM, newborn and child health, and adolescent health.

Each state has a directorate of health services, with program managers for individual public health programs (such as the RCH program) and for administering state-run facilities. Medical colleges are generally under a separate directorate of medical education.

The rural health system in India is well-structured (Table 5.1). An SC is the most peripheral setup of the health care infrastructure. Each SC is staffed by a female multipurpose health worker, better known as the ANM, and a male multipurpose health worker. The salaries of ANMs are provided by the central government throughout the country. An SC covers a population of 5,000, generally spread over 4-6 villages. In tribal and hard-to-reach areas, an SC covers a smaller population. A PHC caters to a population of around 30,000, overseeing 6-8 SCs. A PHC is staffed by one or two general physicians, an LHV, and one or more headquarter ANM. For every 3 to 4 PHCs there is a provision for CHCs, which total 3,077 nationwide. A total of 1,748 CHCs nationwide have been designated as FRUs with provision of a pediatrician, obstetrician, anesthetist, and several general physicians, nurses, and paramedics. There are 2-4 FRUs in each district. Generally, there are one or more multispecialty hospitals at the district headquarters (Figure 5.1).

Not all the villages have a provider from the health department.. The ANM is located in one out of the 4-6 villages that she covers. In many parts of the country, ANMs do not stay at SCs because of reasons of insecurity,[2] lack of living quarters, family constraints, and at times for no genuine reason at all. Most villages, however, have traditional birth attendants and unqualified village practitioners. An Anganwari worker (AWW), belonging to the ICDS, is located in most villages. Her primary responsibility is nutrition, nonformal education, and health education.

Figure 5.1 The health infrastructure (numbers are from the 10th Plan document)[1]

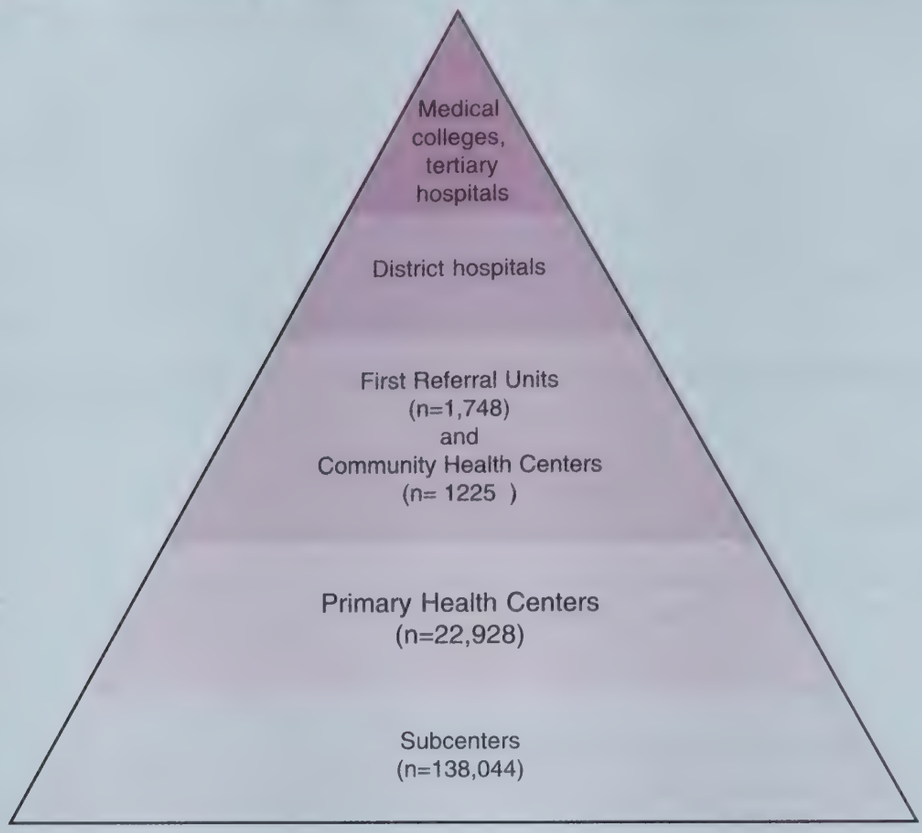


Table 5.1 The health infrastructure

Facility	Norms/Nos.	Designated providers	Mandated activities
SC	1 for 5,000 population; 1 for 3,000 in difficult and tribal areas	• Auxiliary nurse midwife (ANM) • Male multipurpose health worker	• Outpatient counseling/care • Deliveries (some) • Outreach services
PHC	1 for 30,000 population 4-6 beds	• General doctor • LHV • ANMs	•Outpatient care •Deliveries at some
CHC	1 for 4-5 each PHC 30 beds	• General doctors • Sometimes pediatrician or obstetrician • Nurses or ANMs	• Outpatient care • Deliveries at some • Some inpatient care • Care of sick neonates at some
FRU	1 for 500,000 population 30 beds	• General doctors • Obstetrician • Pediatrician • Anesthetist • Nurses	• Outpatient care • Deliveries at many • Comprehensive EmOC at some • Inpatient care of sick neonates at many • Many have newborn care corners
District hospital	50-200 beds	• General doctors • Pediatrician • Anesthetist • Nurses	• Outpatient care • Obstetrician • Deliveries • Comprehensive EmOC at some • Inpatient care of sick neonates • Many have newborn care corners

In addition to the modern (allopathic) health system, India also has almost 3,000 hospitals of the traditional Indian system of medicine, mostly Ayurveda and homeopathy.

Even though the government health infrastructure in India is well planned, the quality of actual operations ranges from mostly dysfunctional facilities in some states to reasonably well functioning systems in other states.

The status of the FRUs and PHCs reported in the Facility Survey (1999) is shown in Tables 5.2 and 5.3. It is obvious that there are major deficiencies at this crucial level of the health system, especially with regard to the availability of specialists and blood transfusion services.

Table 5.2 Status of district hospitals, FRUs and CHCs (Facility survey 1999)[3]

Feature	Proportion fulfilling		
	District hospitals (n=210)	FRUs (n=760)	CHCs (n=886)
Infrastructure			
Tap water	72%	50%	46%
Electricity	98%	96%	92%
Generator	86%	71%	52%
Delivery facility	91%	89%	84%
Aseptic LR	44%	36%	28%
Operation theatre	98%	93%	86%
Linkage with blood bank	66%	17%	9%
Staff			
Obstetrician	78%	48%	28%
Pediatrician	78%	37%	19%
Anesthetist	70%	22%	10%
Gen Medical Officer	94%	89%	81%
One physician trained in EmOC/newborn care	19%/21%	17%/22%	11%/17%
Utilization			
Utilized as referral	33%	34%	25%

Table 5.3 Status of PHCs (Facility survey 1999)[3]

Feature	Proportion fulfilling
Infrastructure	
Water	62%
Electricity	69%
At least one patient bed	82%
Staff	
MO	88%
MO (Lady)	20%
MO staying at PHC	34%
Female health worker	91%
Female health assistant	53%

MO=medical officer

It may be noted that the newborn is not counted as a "bed" in the government and in most private hospitals, but is considered a part of the mother's "bed." As a result, the infrastructure and staff resources are often not budgeted or allocated with newborns in mind. Thus, the most vulnerable patient is not given her due because of archaic rules.

Private Sector Health Services

India has a vast, varied, and vibrant private sector health system. More than 80 percent of qualified medical doctors are in private practice.[4] Private facilities range from small clinics run by an individual, to multispecialty corporate hospitals of international standards. Unfortunately, the formal private sector remains confined to urban areas and has not percolated into the rural hinterland of India. In villages, low quality, "informal" private healthcare is provided by untrained, unqualified registered medical practitioners (RMPs), often referred to as "quacks." Conservative estimates put their number at 1.25 million, almost all of whom have solo practices located in outpatient settings.[4]

The private health system works for profit. In India, where the poor and even the middle classes have no risk-pooling mechanisms, the spending in private healthcare is essentially out-of-pocket at the point of service. Not surprisingly, poor households purchase less curative health care from the private sector than the richer ones. More than 40 percent of hospitalized persons borrow money or sell assets to cover expenses.[5] Yet because of the low level of public sector contributions to health in India, 80 percent of total health spending is comprised of private expenses—one of the highest levels in the world.

Table 5.4 Source of health care for immunization, prenatal care, and institutional delivery[4,6]

	Public sector	Private sector
Immunization	90%	10%
Prenatal care	60%	40%
Institutional deliveries	48%	52%

A comparison of a national sample survey (1986-87 and 1995-96) showed that there has been an increase in the use of the private sector by sick patients, both in urban as well as rural areas.[4] While there was 7-8 percent increase in the use of private facilities as outpatients, the increase was 16-17 percent for inpatient admissions to private health facilities.

Table 5.5 Comparison of the use of health services in the public and private sector between 1986-87 and 1995-96[4]

	1986-1987		1995-96	
	Rural	Urban	Rural	Urban
Treated as outpatients				
Public	26	28	19	20
Private	74	72	81	80
Treated as inpatients				
Public	60	60	44	43
Private	40	40	56	57

A large proportion of private sector hospitals are small establishments, with 85 percent of them having less than 25 beds each (the average number is 10). Between 1974 and 1996, while there was a phenomenal growth in the number of hospitals in the private sector, the overall increase in hospital beds in the private sector was small. This is an indication of the growth of small hospitals and nursing homes in the private sector. The small hospitals in the private sector, also called "nursing homes," are generally owned by one person. Very few of the private hospitals are in the tertiary sector (1-2 percent), and they are generally owned by trusts or corporate houses. A majority of private hospitals, including private nursing homes, are located in urban or periurban areas.

In order to harness the expanding network of private health services for perinatal-neonatal care, its access to the poor has to be ensured through state funding, health insurance, or risk-pooling systems. Some innovative models of such approaches in the NGO sector (SEWA, Gujarat; Ambikapur, Health Association, Orissa) and in the co-operative sector (milk co-operatives in Gujarat and Karnataka) have shown the way forward.[4]

There has been talk of involving village practitioners like RMPs to deliver care to sick women and children. Janani, an NGO working in Bihar, has networked with village practitioners to franchise the marketing of contraceptives. Even though some innovative initiatives have been undertaken to train village practitioners in some states for newborn health, no significant success in involving them in newborn care has been documented. It is true that RMPs are often the only providers at the village level who have some key skills (including giving antibiotic injections), but they fall outside the recognized and lawful health system, and their ability to provide rational, safe, and ethical services is questionable.

NGOs and the Voluntary Sector

In India, it is estimated that about 7,000 voluntary agencies are involved in health-related activities. There are wide interstate variations. NGOs often provide a limited range of services localized to a small geographical area. Some of them implement government programs, while others run basic health care or integrated services. Many NGOs provide services to patients with specific diseases like leprosy; others focus on training, surveys, social marketing, and behavior change communication (BCC) activities. The main problems faced by NGOs include: poor synergy between government and NGOs; limited financial management; the technical and managerial capacity of NGOs; paucity and uncertainty of funds; and delays in the flow of funds from the government. Recently, the central government has streamlined the system of NGO involvement for reproductive and child health services.

Other Health Systems

Apart from the public health system delineated above, there are other government agencies, such as the Indian Armed Forces, the Indian Railways, and other paramilitary forces that have their own health systems and hospitals. These systems cater to the health care needs of their respective employees and their families.

One of the largest and most widespread of these other health systems is that of the Indian Armed Forces. This integrated health system consists of various levels of care, from the primary to the most advanced tertiary care. The Armed Forces have well-established protocols for the transfer of patients from a lower facility to a more advanced one. Their hospitals range from simple health posts to very large tertiary care hospitals with neonatal intensive care units; these hospitals are spread out all across the country, even in the most remote areas. The Armed Forces also has certain hospitals dedicated to special problems, like that for limb prosthesis and spinal injuries. The Armed Forces medical system is meant only for military personnel. The level of perinatal-neonatal care is high. However, the vast organization and methods of delivery of health care by the Armed Forces, especially in the areas of maternal and neonatal health, can be studied and useful lessons learned. One such area is nursing care the standards of which are exemplary.

Key Functionaries at the Grassroots Level

ANMs form the backbone of the rural primary health care system. They operate from an SC, typically covering a population of 4-6 villages. They receive training for a period of around 18 months after completing schooling up to class 12. Their job description is presented below.[7]

Present Activities of an ANM

1. Register pregnant women from three months of pregnancy onwards
2. Provide care to pregnant women
3. Give advice on nutrition to expectant and nursing mothers.
4. Distribute IFA tablets to pregnant and nursing mothers
5. Immunize pregnant mothers with TT vaccine
6. Refer cases of complicated pregnancy and cases with medical and gynecological problems
7. Conduct deliveries at SCs and homes
8. Supervise deliveries conducted by TBAs wherever called in
9. Refer cases of difficult labor and newborns with complications
10. Provide postpartum care
11. Spread the message of FP to couples, motivate them for FP individually and in groups
12. Perform DPT, polio, BCG, and measles vaccination to infants in her area
13. Record and report births and deaths occurring in her area
14. Test urine for albumin and sugar and check the hemoglobin of antenatal cases
15. Identify women leaders and participate in the training of women leaders

The cadre of ANMs was originally conceived as birth attendants, as the name "midwife" implies. Over the years, however, ANMs became the focal point of many activities. In the decades after the 1960s FP and, later, immunization became their major activities because of the national thrust in these areas. This led to the neglect of other priorities, including skilled assistance at deliveries.

The job description of the ANM lacks an explicit emphasis on neonatal care. The NNF recommended the addition of the following competencies in newborn care: instruction to mother and family on how to prepare for the newborn's birth at home; care of the normal newborn at birth; check listing after delivery; advice for home care of normal neonates; home messages on danger signs; care of "at-risk" newborns; transportation of the newborn; and care of the baby when referral is refused.[8]

A skills-based in-service training is envisaged in the RCH program, as imparted by the NIHFW with its network of regional institutions. There is a need to strengthen the newborn care content of the training module and to give a major thrust to the training effort to achieve the desired coverage. The NNF has recently developed a training module for basic health workers.

Many ANM posts remain unfilled due to a variety of reasons. In 2000, of the 144,012 posts, 22,371 (15.5 percent) were unfilled.[1] An ANM was originally expected to cover a population of 5,000, but with increases in population, many of them are looking after 8,000-10,000 individuals. The result has been an enormous increase in workload.

An ANM is expected to stay at the SC, but more often than not she commutes to her area of work from her home in a nearby town. There are many reasons for this problem of nonresident ANMs: the SC may be located outside the main village in an insecure location; set in a dilapidated condition; it may have no residential premises; the ANM's husband may not be working in the same or a nearby place; there may not be any school for children; and many ANMs fear for their personal security, particularly in some specific states. In a study from Rajasthan, 67 percent of 231 ANMs in four blocks in the Udaipur district considered SCs to be unsafe for living. The risk of sexual harassment by village men emerged as another important reason for not residing in the SC in this study.[2]

TBAs

A TBA is a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or through an apprenticeship to another TBA.[1] A trained TBA is one who has received a short course of training through the modern health sector to upgrade her skills.

The TBAs tend to be older women, often belonging to low caste communities. However, they are respected in the community for their knowledge and experience. The TBAs are often illiterate, and most work independently. Since they belong to lower castes, traditionally their roles are limited to assisting the family during delivery and for a variable part of the postpartum period (which is considered to be unclean). Their typical role includes assisting in labor, often in an advanced stage, in the delivery of the baby and placenta, and in immediate care of the mother and the neonate. The TBAs are quite popular in the community since they perform many tasks which the midwife or other health care providers are not willing to do. These include bathing and massage of the mother and newborn, washing clothes, cleaning the house, and observing rituals depending on the local customs. The TBAs receive remuneration from the family in cash or kind in recognition of the services they render.

According to NFHS II, TBAs assisted in 40 percent of deliveries in rural areas and 19 percent in urban areas.[6] The training of TBAs was promoted by international agencies in the 1970s. The Government of India launched a TBA training program in the Second Five-Year Plan with the objectives of training them in their profession and on how to use their influence in the community.[3] Consequently, in India more than 600,000 TBAs were trained. The training duration, extent, and quality have varied considerably. With such a wide variation in training, it is not surprising that the outcomes and outputs of training are mixed. Care of the newborn has not been formulated in the training curriculum even though the NNF of India has clearly defined the training requirements for neonatal care in domiciliary deliveries.[11] Most training of TBAs has been a one-time effort, although training in some programs has been ongoing. Training programs often do not take into consideration the local context and needs, or TBAs' lack of literacy or traditional practices. The apprenticeship model of training has been ignored.

Several pioneering studies have been done in India which show that training TBAs in resuscitation and case management of ARI/pneumonia does make a difference in neonatal outcomes.[12-14] Pneumonia case fatality rate was 0.9 percent in the villages where TBAs, VHWs, and paramedical workers were trained and supplied co-trimoxazole as compared to 13.5% percent in control area in a study conducted in Maharashtra[14]. There was a 20 percent decline in overall NMR. The training was continuous and combined with educative supervision.

Studies have shown that TBAs, AWWs and other community health workers are able to reduce neonatal mortality amongst LBW babies.[15] TBAs, after training, were able to weigh newborn babies to identify BW by using a color-coded weighing balance.[15] Trained TBAs have successfully participated in promoting clean delivery kits and administering TT during pregnancy.[12,17]

Effective TBA training could result in changing behavior, and continuing the training of TBAs may prevent them from reverting back to their old traditional practices. A higher proportion of TBAs participating in continuing training advised TT vaccination and hospital referral in cases of prolonged labor and were less inclined after training to advise injections to speed up labor.[18] Fears were overcome that improved nutrition in pregnancy would lead to larger babies contributing to prolonged labor and more complications. TBAs were competent in weighing neonates and advised breastfeeding.[18] TBAs in a tribal area in Maharashtra were successfully trained in maintaining warmth, identifying a small baby for hospital care, and providing resuscitation [19] Harmful traditional beliefs and practices during pregnancy, childbirth, and the postnatal period were reduced through TBA training carried out in accordance with the recommendations of the government in Madhya Pradesh.[17]

An important intervention, supported by WHO and the Program for Appropriate Technology in Health (PATH) and carried out by the Survival for Women and Children (SWACH) foundation, has shown the feasibility of management of birth asphyxia by TBAs.[13] The TBAs learned how to recognize asphyxia and manage it successfully, with a reduction in the case fatality rate for asphyxia. This intervention was effective if TBAs conducted more than 25 deliveries per year. Severely asphyxiated babies could not be salvaged because the TBAs did not undertake cardiac massage. The TBAs who used mouth to mask equipment generated the recommended pressure but had difficulties in sustaining the recommended breathing rates. The use of mucus extractors and bag and mask ventilation of asphyxiated babies was demonstrated. In another study, lower perinatal mortality was shown in deliveries conducted by TBAs who provided resuscitation by using modern methods.[20]

It is pertinent to refer to a recent meta-analysis on the effectiveness of TBA training in improving neonatal health outcomes in which studies from India were included.[21] The meta-analysis associated TBA training with substantial and significant improvements in TBA knowledge (90 percent), attitudes (74 percent), behavior (65 percent), and advice (90 percent). There is a small but statistically significant decline in perinatal mortality associated with trained TBAs (a 4 percent decline overall or 8 percent fewer deaths when one extremely large study is excluded from the analysis). Decreases in neonatal deaths due to specific causes—birth asphyxia (11 percent) and NNT (2 percent)—are also significant.

TBAs are an important community resource and care providers. They may not have contributed in reducing maternal deaths, but they can play a critical role in newborn health by undertaking clean delivery practices and by catalyzing healthy family practices, including early and exclusive breastfeeding, warmth, prevention of sepsis, and detection of danger signs. Because of the trust many families have in TBAs, TBAs may be able to influence behaviors. TBAs will continue to be important for India's newborn health program in the future.

Integrated Child Development Services (ICDS)

The ICDS scheme of India is the largest child nutrition and development program in the world. Started in 1975 in pursuance of the National Policy for Children, it now covers 75 percent of the nation's community development blocks and 273 major urban slums in all states.[22] Beneficiaries of the program are children below six years and pregnant or lactating women. The ICDS program is run by the Department of Women and Child Development of the Ministry of Human Resources Development, in association with the nodal department at the state level—generally the Department of Social Welfare or the Department of Rural Development. The entire expenditure on the program is centrally sponsored, except for the cost of supplementary nutrition which is borne by the states.

AWWs

AWWs, each of whom covers the population of an average village (about 1,000) as an honorary worker, are the key functionaries of the ICDS program. The AWW lives in the village, has middle school or higher education, receives pre-service training, and is paid an honorarium of Rs1,000 per month. She is assisted by a helper. There are 500,000 AWWs and an equal number of helpers in the country. The AWW operates from the premises provided by the community (the Anganwari).

Objectives

- To improve the nutritional and health status of children in the 0-6 years age group
- To lay the foundations for proper psychological and social development of the child
- To reduce mortality, morbidity, malnutrition, and school drop-out rates

- To achieve effective coordination of policy and implementation amongst the various departments to promote child development
- To enhance the capability of the mother to look after the normal health and nutritional needs of the child through proper nutrition and health education

Activities and services

The services provided by ICDS encompass areas of nutrition, preschool education, and health (Figure 5.2). Children spend a few hours at the Anganwari to play, learn, and eat.

The supplementary nutrition component includes supplementary feeding of children and pregnant and lactating women, vitamin A supplementation, and prevention and control of anemia in children and women. The AWW provides a meal to the beneficiary children and women 300 days each year. Severely malnourished children get additional food. Early childhood care and preschool education are the other two critical components of ICDS. This covers early stimulation and informal education. The Anganwari is the local site for providing immunization and conducting health checkups of children and antenatal checkups of women by the ANM. The AWW also conducts growth monitoring of children, provides health and nutrition advice, and renders referral advice in sickness. A recent addition is a scheme for school drop-out adolescent girls (11-18 years) in about 10 percent of the blocks. The package of interventions includes self-development, nutrition, health education, and literacy.

The AWW has many health and nonhealth roles. At the village level, she works closely with the ANM who, in turn, depends on her for conducting immunization and antenatal checkups at the village level. However, the AWW is supervised by ICDS functionaries, and the health department has little say. At the state and central level, the health department/ministry and the ICDS nodal department/ministry have inadequate coordination despite policy directions for close synergy.[23]

ICDS and newborn health

The ICDS program, at present, does not include a specific component on newborn health. Some activities listed above (e.g., supplementary nutrition to pregnant/lactating women, antenatal checkups) have a potentially positive impact on neonates. As part of growth monitoring activities, the program envisaged weighing neonates at birth, but that has not been implemented rigorously. An AWW is expected to promote breastfeeding but does not routinely assist the women of her village in early initiation of breastfeeding. She is expected to perform home visits for mothers and infants if necessary, but that role often remains neglected.

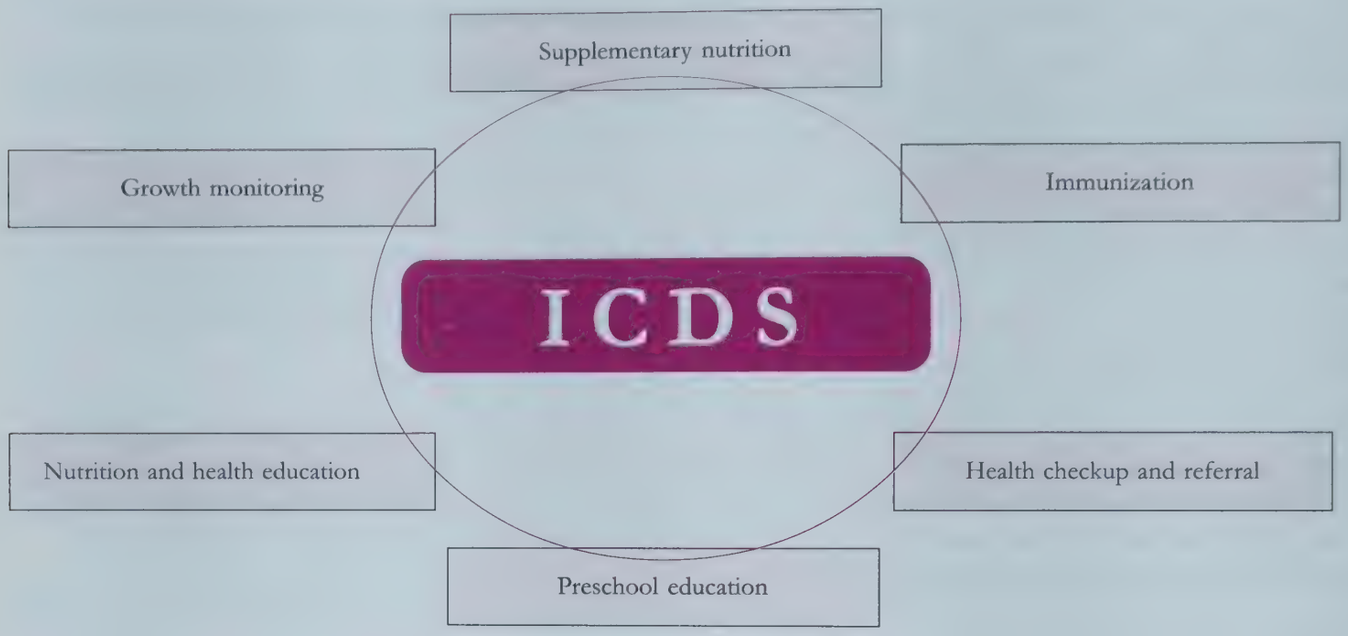
An AWW can play a decisive role in promoting neonatal health at the home and community levels, after being properly trained. Her presence in most villages and underprivileged urban areas is a great asset. She is respected by the community. She could take on a more effective role to promote skilled attendance and institutional deliveries, as well as EmOC. She could, through home visits, contribute effectively to the following components of ENC: early and exclusive breastfeeding, temperature maintenance, cord care, prevention of infection, assisted feeding of LBW babies, early detection of sickness, treatment of minor problems (skin pustules, eye discharge, cold stress, etc.), and referral of sick neonates.[19] Pilot studies have shown her to be able to effectively use Integrated Management of Child Illness (IMCI) and Integrated Management of Neonatal and Child Illness (IMNCI) algorithms for ENC interventions.

ICDS program managers receive many requests for introducing additional health interventions (TB, malaria, HIV, child health), but they feel they are unable to add new activities over and above the existing repertoire of tasks lest the program lose its focus and depart from its original role. There is a genuine concern as to whether the AWW has time for additional responsibilities. A recent review of the role of ICDS recommended that operational research be carried out to assess the feasibility of introducing newborn care

through ICDS.[74] Incorporating ENC into the service package of ICDS would require a policy decision at the highest level. In addition, some additional resources would be required for training, capacity strengthening, and possible compensation for extra work by the AWW.

If AWWs could be involved in providing home-based newborn care, it could be a turning point for newborn survival and health in India.

Figure 5.2 Services provided by the ICDS program



Newborn Nursing and Midwifery

Status

Nurses play a crucial role in neonatal care at all three levels of care: primary, secondary, and tertiary. Improving nurses' skills in neonatal care is a priority and a challenge.

There are over 600 nursing schools in India. At present the nurses employed in the care of newborns in primary, secondary, and tertiary levels are general nurse midwives (GNMs), who have three years of training in general nursing and midwifery. A few Bachelor of Science (B.Sc.) trained nurses are also working in some tertiary care hospitals. The nurses, both at the GNM and the B.Sc. levels, are trained to be general nurses and do not specialize in any clinical specialty. The GNM and B.Sc. nurses are registered as "nurses" as well as "midwives." All the nurses are expected to have basic knowledge and skills in dealing with normal mothers and newborns, but they typically lack proficiency in dealing with high-risk mothers and babies. Some nurses working in the newborn areas get on-the-job training, and a few are exposed to training workshops in neonatal care. Because most hospitals treat all nurses as nonspecialists, even those trained or experienced in neonatal care are liable to be transferred to other areas of the hospitals. Likewise, a handful of nurses having post-basic diplomas in neonatal nursing do not necessarily have postings in the neonatal units due to the absence of a specialist cadre in neonatal nursing.

A small number of nurses trained in neonatal/pediatric/obstetric nursing at post-graduate levels are absorbed in the nursing education institutions as teachers and are therefore not available for clinical work.

GNM-trained nurses working at the PHCs, CHCs, FRUs, and district hospitals look after all patients, including mothers, neonates, and children.

In the urban areas, neonatal intensive care units (NICUs) have been established in many tertiary care hospitals and other urban hospitals in the government and private sectors, where GNM nurses are also deployed.

A new cadre of community skilled birth attendants is being introduced on a pilot basis.

Manpower needs

The recommended nurse/baby ratios in the neonatal intensive care units are as follows:

1:1 for all infants who are extremely ill and on respirators and monitors; this requires three nurses per baby for a 24-hour period

1:2 babies who are still sick, on intravenous funds and monitors but not on ventilators

1:3 babies who are not in acute danger

This requirement is based on the dependency level of the babies, their clinical stability, and the level of technical support required.

The Staff Inspection Unit[25] norms for nurses in the central government hospitals recommend one staff nurse/nursing sister for every two babies in the NICU. An additional 10 percent leave reserve and 45 percent reserve staff are also recommended. In addition, the unit recommends nursing supervisors (30 percent of the staff nurses). However, the actual placement of nurses in the newborn areas is far from the recommended norms, none of these norms been uniformly accepted by all the states.

Education and training

The nurse is the key provider for newborn babies in the hospitals. It is very important for nurses to be updated and informed about the latest advances in order to give their best contribution to the survival of the newborns.

Care of the newborn baby, particularly the sick one, is a very demanding and challenging job, requiring discipline and dedication in addition to knowledge and skills. The field is growing every day, and innovative advances are bringing in new and sophisticated technology to the care of the newborns.

Neonatal nursing is a core competency in the GNM curriculum as well as in B.Sc. nursing programs.[26,27] However, the existing nursing curricula promote theoretical teaching, with less emphasis on skills. The lack of teaching-learning facilities and the inadequate number of teachers in nursing schools result in poor quality training. The quality of clinical practicals in different nursing schools is not uniform. Learning is generally task-oriented, with very little opportunity for the development of critical thinking skills.

Training and education to improve the effectiveness of nursing care in various medical specialties, including neonatology, have not been given the importance they deserve. Some initiatives have been taken to develop a core of nurses trained in the care of neonates. The first attempt was made in 1988 when the first nurse leadership training course on the care of the high-risk neonate in developing countries was held at Srinagar[28]. Subsequently, many short courses in neonatal nursing have been conducted in various states of the country. In 1993 the first postgraduate diploma course in neonatal nursing was started in Mumbai. In 1993, the NNF organized a working group which analyzed the existing training of nurses in neonatal nursing and provided recommendations for in-service training and formal courses in neonatal nursing.[29] The highlights of the recommendations are below.

NNF Recommendations on Newborn Nursing[29]

In-service training	**Orientation program:** All nurses posted to newborn units should undergo a two-week orientation program before being assigned to any formal responsibility.
	Refresher course: Nurses who are likely to work in newborn units for an extended period and those who wish to obtain in-depth expertise in neonatal nursing must undergo a 6-week refresher course to enable them to achieve a high level of competence.
	Basic course (GNM and B.Sc.nursing): There is a need to increase the hours of instruction and supervised practice. Both curricula should be competency-based with emphasis on skill development.
Pre-service training	**Postgraduate diploma in neonatal nursing**: To create a leadership cadre in neonatal nursing a 10-month P.G. diploma in neonatal nursing should be introduced. The graduates from these programs should be employed in newborn units as clinical nurse specialists, with opportunities for promotions within the clinical units. They should also function as clinical experts and nurse academicians, as well as managers of neonatal nursing services.

Through another initiative, the Government of India under a WHO-sponsored scheme started training nurses in neonatal specialties for three months in Mumbai beginning in 1998. Although the facilities to undergo a post-basic diploma in neonatal nursing exist, there are not many people who take the course, as there is no policy or positions to use these nurses in the clinical units.
In a September 2000 workshop, UNICEF, NNF, and All India Institute of Medical Sciences (AIIMS) drafted a training module on newborn nursing for district and subdistrict hospitals. The module has since been refined and field-tested, and is being disseminated with support from SNL.

Specialization

A specialist in nursing is a person who has undergone a postgraduate degree in the specified area of clinical specialty. The specialties covering the neonatal component recognized by the Indian Nursing Council are in the areas of pediatric nursing and obstetrical nursing. Neonatal nursing as a specialty is not yet offered exclusively.

The objective of the postgraduate training is to prepare nurses to work as advanced practitioners in the clinical area and also as teachers, managers, and researchers. However, due to the very small number of nurses taking up postgraduate training and the lack of clinical positions for nurse specialists, most of them have to work as teachers in the nursing educational institutions and are, thus, lost to clinical nursing.

An experimental project has been launched by the Indian Nursing Council to develop a category of nurse practitioners in midwifery who will be authorized to practice independently in the areas of midwifery and neonatal care at the CHC level. This experiment will open the gates for the development of similar positions of clinical nurse specialists in neonatal care.

The challenge

In order to improve neonatal survival we must ensure the provision of quality nursing care to neonates at all levels of care. The nurses must keep abreast of the recent advances in neonatal care. There is also a need to expand the role of nurses and to create a core of professional, skilled, and motivated neonatal nurses. The following actions need to be initiated today to meet the challenge of reducing the NMR:

- Infrastructure and facilities should be created for in-service training of ANMs and general nurses in newborn care at various levels.

- The skills of the GNM nurses posted at the PHC/CHC levels should be refreshed in the areas of midwifery and ENC and their role expanded to include conducting normal deliveries and giving ENC.
- All nurses working in maternal and neonatal care areas should receive ongoing in-service training to update them in recent advances in midwifery and neonatal care.
- The government, Indian Nursing Council, professional associations, and the NNF should join hands to develop and disseminate learning resource materials in newborn nursing and midwifery.
- Nursing service administration must prioritize newborn care areas when allocating nurses.
- A specialty cadre of neonatal nurses should be created with training and commitment to newborn care. These nurses should have enough opportunities to work independently and receive adequate salary and promotional opportunities within the neonatal units.
- Positions of clinical nurse specialist in neonatal nursing should be created in all the NICUs.

Neonatal Intensive Care

Needs assessment

The major factors determining the need for neonatal intensive care services are population, birth rate, and proportion of live births that are VLBW (i.e., less than 1,500 gm). India has a population of over one billion, and approximately 26 million babies are born in the country each year. In the cohort of 49,960 neonates at 16 centers of the NNPD, 32 percent of babies were LBW, 3.7 percent weighed less than 1,500 gm, and 0.7 percent less than 1.000 gm.[30] If we use the NNPD data to determine the quantum of the total VLBW babies in the country, it comes to 0.9 million babies per year. The average stay of a VLBW baby in the intensive care is around three weeks, so if we take 100 percent occupancy on all 365 days, we need over 510,00 NICU beds committed to the care of these babies. Data from developed countries show that VLBW infants represent approximately 1.5 percent of births, but their need for intensive care consumes 7 out of 10 intensive days.[31] PA and septicemia are other major causes of morbidity and mortality qualifying for neonatal intensive care.

If we take these factors into consideration, we may need over 72,000 neonatal NICU beds for the country. The existing neonatal intensive care beds in the country at accredited units today are less than 2,000, or less than three percent of the requirement.

Existing service provision and utilization

NICU care started in the early 1960s in India in a few teaching hospitals. A survey done on the status of neonatal intensive care services by the NNF in 1987 revealed a very unsatisfactory picture. Only 3-4 centers in the country had facilities and equipment to meet Level II criteria, and not a single unit in the whole country could qualify as Level III nursery.[32,33]

In 1989 the NNF formulated a committee to develop criteria for Level II accreditation of neonatal units. In 1990, the NNF formally started accrediting NICUs in the country. A total of sixty units have been accredited as Level II units through 2002. These units have a cot strength of about 10-30 cots each and are mainly in large metropolitan cities. Delhi has 10, Mumbai 6, Pune 4, Bangalore 4, Chennai 4, and Kolkata 3. Some states have only one or two such accredited units. About one-third of these units are in private teaching and nonteaching hospitals, and the rest belong to medical colleges. There are over 160 medical colleges in the country, and a large proportion of them do not have even Level II accredited units.

Another survey conducted in 1995 revealed that facilities at many centers had improved, with NICU's at ten centers at Level III. Almost 30 centers had established neonatal ventilation services. Better technological advances in indigenously designed and fabricated equipment and more units using ventilation services, were a positive sign.[34]

To review the status of various NICUs in the country, the NNF conducted another survey in 2000.[35] It surveyed 40 centers; most of these were Level-II accredited units, but a few units, which according to the authors qualified but were not formally accredited, were also included. There was some improvement as far as the availability of functioning equipment of all categories was concerned as compared to the earlier surveys. However, the majority of the units continued to have inadequate equipment according to NNF Level-II criteria. About 20 percent of equipment was nonfunctional due to poor after-sales services by the dealers, lack of availability of spares, poor upkeep of the equipment, and no system of annual maintenance contracts. One of the important reasons for the better status of equipment in the present survey was the indigenous production of neonatal equipment such as resuscitation bags, resuscitation bassinets, open care systems, incubators, and glucometers of good quality, which had picked up.

A complete manual on neonatal equipment with special reference to indigenously manufactured neonatal equipment for the benefit of young doctors and administrators has recently been published.[36]

In the last 10 years, newborn care services in large tertiary care hospitals have improved further. Neonatology has been accepted as a subspecialty of pediatrics, and more neonatal content has been added to the curriculum and medical training. Neonatal intensive care has become a status symbol for the private sector. Even small hospitals in cities and towns have started neonatal units consisting of 2-6 beds and some equipment. The media has promoted the glamour and importance of newborn health, which has enhanced public awareness about neonatal nurseries.

The NNF has recently developed criteria for Level III accreditation of NICUs and is contemplating a system of periodic reevaluation of accredited units to monitor these standards. Another important task is strengthening and improving NICU services in medical colleges.

Cost of neonatal intensive care

Neonatal intensive care is very expensive. A study from Chennai estimated that the average hospital costs per day were higher among nonsurvivors (Rs1,857; US$37) than survivors (Rs727; US$14.54).[37] The cost of NICU care to the hospital and directly to the patient has been worked out in a study at AIIMS.[38] The study estimated the capital and recurrent cost of NICU. For calculating the cost per baby, the clinical course of 35 consecutive neonates was taken into account and cost expressed from the hospital's standpoint. In addition, 20 parents were interviewed to assess the direct cost of drugs and disposables purchased by them. Analysis showed that the average cost of care of a baby admitted to NICU was Rs1,685 (US$33.70) per day to the hospital. In addition, parents spent around Rs250 ($5) per day out of their pockets for drugs and supplies. The total cost of care for the VLBW neonate was Rs43,558 (US$871.10)—less than half of the charges for an adult undergoing coronary bypass surgery in the same institute, with 6-8 times more life years gained.

The NICU charges in leading private hospitals in major cities range from Rs2,000-Rs15,000 (US$40-300) per day depending on the level of care.

Factors influencing the outcome of neonatal intensive care

Different types of units treat infants with very different categories of clinical risk and illness severity. Large tertiary hospitals, institutes, and universities with Level III services accept high volumes of sick infants with complex needs. They have high occupancy with decreased medical and nursing staff to cot ratios, which affects their performance. The outcome and care of these infants would improve if the best-resourced NICUs catered to the sickest referred cases only, leaving those with moderate sickness for care at medium-

sized units. The large units can not only provide support for referral but also strengthen their own operations and provide a base for teaching, training, and research.

In a survey of ten tertiary care units in Delhi, all the units claim that their equipment, medical, and nursing, staff-to-cot ratio met NNF Level II accreditation criteria. They also claim that their occupancy was nearly 100 percent throughout the year, and that most of them do not refuse admissions. Three factors which determine the adequacy of NICU service provision are occupancy, babies transferred out, and refused admissions. With occupancy rates as high as 100 percent, there is clearly a lot of pressure on these units.

Problems of small and medium-sized units

There is a large number of private hospitals and nursing homes, with smaller units in cities and towns, which take care of sick neonates. Some also provide neonatal ventilatory support. These units are managed by one or more pediatricians. This raises issues regarding skill maintenance, clinical governance, and staff shortage. Nonetheless, this is a section of vibrant young pediatricians keen on establishing neonatal services and taking care of a large volume of neonatal care need in the country. Some problems faced by these units can be solved by clubbing together resources, staff, and transport services and by providing in-service training to the staff.

Conclusions

Neonatal intensive care in institutions is improving, but even today most of the Level II units are clustered in a few large metropolitan cities. Unfortunately, many medical colleges still do not have Level II NICUs.

Neonatal care in the private sector is coming up in a big way. Private institutions have a high volume of admissions and work, better equipment, and more staff. Even smaller hospitals and nursing homes are getting equipped to take care of sick babies, but it is essential that larger referral units support them with referral and training of personnel.

Neonatal intensive care, however, remains out of reach for most families. Experience in Sri Lanka has shown that NMR can be brought below 20 per 1,000 live births without a single NICU in the country.[39]

Neonatology in Medical Education

The NNF prepared guidelines on the neonatology component of pediatrics for undergraduates in 1991.[40] Pediatrics became a full-fledged subject in the undergraduate Bachelor of Medicine and Bachelor of Surgery (MBBS) medical curriculum in 2000. Neonatology has 25 percent weight in teaching and formal assessment of pediatrics.

The IAP and the NNF have developed guidelines for the postgraduate Medical Doctor (MD) program in pediatrics encompassing neonatology. 25 percent of training time and weight in assessment is recommended for neonatolgy.[41]

To improve practices and keep up the skills of health care providers, it is important that continuing medical education and in-service training opportunities be provided. Unless this is done in a systematic manner using reliable educational tools, the dividends in terms of improving newborn health may not be forthcoming in the coming years. Steps need to be taken to introduce a system of credits for attending continuing education activities. The NNF is associated with the Government of India and international agencies for spreading education for ENC for all levels of health care providers.

A postdoctoral program in neonatology has been started in four institutions in the country. The aim is to provide advanced training in neonatology to produce competent super-specialists who are able to provide clinical care of the highest order to newborn infants and serve as future teachers, trainers, researchers, and leaders in the field of neonatology.

6 Policies and Programs

Policies

National Population Policy (NPP), 2000

The NPP, announced in the year 2000, is the overarching policy framework for FP and maternal and child health goals, objectives, and strategies.[1]

According to the NPP, the overriding objective of economic and social development is to improve the quality of people's lives, enhance their well being, and provide them with opportunities and choices to become productive members of society. The vast number of people of India can be the country's greatest asset if they are provided the means to lead healthy and economically productive lives. The immediate objective of the NPP 2000 is to address the unmet needs for contraception, health care infrastructure, and health personnel, and to provide integrated delivery for basic reproductive and child health care services. In pursuit of these objectives, the national sociodemographic goals to be achieved by 2010 include the following: reducing the IMR to below 30 per 1,000 live births and the MMR to below 100 per 100,000 live births; achieving 80 percent institutional deliveries, 100 percent deliveries by trained persons, and 100 percent registration of births, deaths, marriage, and pregnancy; and converging in the implementation of related social sector programs so that family welfare becomes a people-centered program (Table 6.1).

Under the NPP, 12 strategic themes are identified. Those most prominent and relevant to newborn health follow:

1. Village panchayats to identify and provide responsive, people-centered, and integrated basic reproductive and child health care;
2. An integrated package of essential services at the village and household levels through a partnership of the government with voluntary and NGO sectors;
3. A one-stop integrated and coordinated delivery at the village level for basic reproductive and child health services;
4. Empowered women for improved health and nutrition;
5. Intensified neonatal care through forming a national technical committee, extending the baby friendly hospital initiative (BFHI) to the SC level, and incorporating skill upgrade for trained birth attendants and essential equipment for SCs;
6. Mainstreaming of the Indian systems of medicine and homeopathy;
7. Establishment of partnerships with the private sector and NGOs.

Provisions were made in the NPP for the disadvantaged and the vulnerable. In support of the NPP, a National Population Commission presided over by the Prime Minster and including chief ministers of all the states has been established to monitor and oversee the effective implementation of NPP 2000.

National Health Policy (NHP), 2002

The NHP recognized the noteworthy successes in health since the enunciation of the first NHP in 1983.[2] These successes included the eradication of smallpox and guinea worm, the near eradication of polio, and progress towards the elimination of leprosy and NNT. There has been an impressive decline in the total fertility and infant mortality rates. The NHP sets out a new policy framework to achieve public health goals in the socioeconomic circumstances currently prevailing in the country. The approach would increase access to the decentralized public health system by establishing new infrastructure in deficient areas and upgrading the infrastructure of existing institutions.

The NHP expresses concerns about the inequity of health care by highlighting the major rural-urban differences, the poor achievements in states with high proportions of people living below the poverty line, and the gap that exists between scheduled caste, scheduled tribes, and others.

Under the policy, the central government will emphasize growth in the aggregate public health investment through a substantially increased contribution by the central government. The contribution of the private sector in providing health services is also expected to be enhanced, particularly for the population group that can afford to pay for the services, and there will be an increased sectoral share of allocation to primary health care. At present, public spending on health is very low and stagnant—0.9 percent of GDP. It is proposed to increase health expenditure by the government to 2.0 percent of GDP by the year 2010, to increase state sector health spending from 5.5 percent to 7 percent of GDP by the year 2005, and to further increase state spending to 8 percent by the year 2010. The NHP also sets out an increased allocation wherein 55 percent of the total public health investment shall be for the primary health sector, 35 percent for the secondary health sector, and 10 percent for the tertiary sector.

Five-year plans

The country took to the model of five-year planning for development in key sectors including health in the 1950s. The Planning Commission of India, which steers the five-year plans, is chaired by the Prime Minister. Currently, the 10th five-year plan is under implementation. The RCH program activities are an offshoot of the broad strategic approaches enunciated in the 10th Plan recommendations. The 10th Plan specifies country and state level goals for NMR decline by the year 2007 (Table 6.2).[3] The 10th Plan Steering Committee on Family Welfare called for the operationalizing of appropriate ENC in all settings.[3] Budget provisions related to some aspects of neonatal health included: home-based newborn care (Rs200 million), TBA training (Rs400 million), community-based midwives training (Rs300 million), neonatal equipment (Rs200 million), and operationalizing FRUs for EmOC and neonatal care (Rs500 million).

Table 6.1 Projected goals of key child and maternal health indicators

Indicator	10th Five Year Plan Target year 2007	National PopulationPolicy[1] Target year 2010
MMR(per 100,000 live births)	200	<100
IMR(per 1,000 live births)	45	<30
NMR(per 1,000 live births)	26	-

Table 6.2 10th Plan NMR targets by state

Name of State/ UT	Current levelNFHS-21998-99	Expected level2007
Andhra Pradesh	43.8	22
Assam	44.6	30
Bihar	46.5	25
Chattisgarh	54.9	38
Gujarat	39.6	22
Haryana	34.9	23
Jharkhand	46.5	35
Karnataka	37.1	21
Kerala	13.8	5
Madhya Pradesh	54.9	30
Maharashtra	32.0	20
Orissa	48.6	35
Punjab	34.3	15
Rajasthan	49.5	30
Tamil Nadu	34.8	20
Uttar Pradesh	53.6	35
West Bengal	31.9	25
Arunachal Pradesh	41.8	30
Goa	31.2	20
Himachal Pradesh	22.1	15
Jammu & Kashmir	40.3	30
Manipur	18.6	10
Meghalaya	50.7	40
Mizoram	18.8	12
Nagaland	20.1	15
Sikkim	26.3	20
Uttaranchal	53.6	30
Delhi	29.5	20

Millennium Development Goals (MDGs)

India is a signatory of the Millennium Declaration of the UN Millennium Summit of 2000 and thereby committed to the achievement of MDGs by 2015.

Common Minimum Program (CMP), 2004

CMP is the agreed program charter of the coalition partners of the present national government of the United Progressive Alliance (UPA that took over in May 2004. CMP envisages an increase in public spending on health from 0.9% of GDP to 2-3% in the next 5 years with a focus on primary care.[4] A targeted FP program will be launched in the 150-odd high fertility districts. A national health insurance scheme for poor families will be introduced.

Other policy frameworks

India has established a National Nutrition Mission and a National Plan of Action on Children is under preparation as a follow-up of the resolution adopted at the UN General Assembly Special Session on Children held in 2002.

Programs on Maternal and Child Health in India

In India, the health sector is primarily under the purview of the state governments, with the central government providing broad policy guidelines, technical assistance, and additional resources. In addition, the central government plans, funds, and supports the implementation of a limited number of "national programs" in high-priority areas through the states. FP, maternal health, and newborn and child health come under the umbrella of one such national program, the RCH program. The RCH program is steered by the Department of Family Welfare in the Ministry of Health and Family Welfare led by the Secretary (Family Welfare).

Evolution of family welfare programs in India

At the time of India's independence, health care services in India were scant, predominantly urban, hospital-based, and curative in approach. Gradually, the health care infrastructure was developed to increase access to health services in both rural and urban areas. The NPP program was launched in 1951, and the earliest child health initiative consisted of immunization with smallpox and BCG (anti-tubercular) vaccinations. The expanded program on immunization was started in 1978 to protect against six diseases.

In the 1980s, a major thrust was imparted to the primary health activities to operationalize the Alma Ata declaration. The goals of Health for All by 2000 were articulated. The significant MCH-related goals were to bring down the IMR to less than 60 per 1,000 live births and the PMR to less than 35 per 1,000 births. The Universal Immunization Program (UIP) was launched in 1985-86, and the first NHP was formulated in 1983.

CSSM program

Newborn health was recognized as a priority in the early 1990s. For the first time, ENC was introduced into the national program as a part of the CSSM program in 1992 at the conclusion of the UIP. The program was initially approved for a period of seven years with a total outlay of about Rs11255 million, with assistance from the World Bank and UNICEF. CSSM aimed at addressing the major causes of maternal and childhood mortality. The expected beneficiaries were 27 million pregnant women and 110 million children under five (including 25 million infants).

ENC Package

The components of the ENC package included:

- Resuscitation of asphyxiated newborns
- Prevention of hypothermia
- Prevention of infections
- Exclusive breastfeeding
- Referral of sick newborns

To operationalize this package, the Government of India initiated a pilot District Newborn Care program in 1994 in collaboration with the NNF. The project envisaged a supply of indigenously manufactured newborn care equipment, supported by on-site training of medical and paramedical personnel and follow-up. The project was initiated in four districts (Bhilwara in Rajasthan, North Arcot in Tamil Nadu, Dhar in Madhya Pradesh, and 24 Parganas North in W. Bengal) and included the district hospitals, selected FRUs, and PHCs. The project was subsequently extended to 26 districts in the country. The equipment supplied for newborn care is given in Table 6.3.

Table 6.3 Equipment for newborn care in the CSSM district newborn care program

Equipment	Quantity
District hospitals	
• Resuscitation bags with 2 face masks	3
• Infant radiant warmer	3
• Weighing scale	3
• Oxygen hoods	1
• Suction machine	3
• Mucus suction traps	—
FRUs	
• Resuscitation bags with 2 face masks	2
• Infant radiant warmer	2
• Weighing scale	2
• Oxygen hoods	1
• Suction machine	3
• Mucus suction traps	—
PHCs	
• Resuscitation bags with 2 face masks	1
• Weighing scale	1
• Table lamps with 200W bulbs	1
• Baby cradle/bassinet	1
• Mucus suction traps	—

Source: National Child Survival and Safe Motherhood Program, Maternal and Child Health Division, Department of Family Welfare, Ministry of Health and Family Welfare, Government of India, January, 1994

Training

The objective of training was to strengthen the management skills of medical and paramedical personnel. A national core team aided in the development and implementation of the training schedules. The state and district core teams underwent a seven-day training program. For paramedical workers, the duration of training was five days. Newborn care training was integrated with that for diarrhea and ARI into a six-day integrated clinical skills course for physicians. The training of TBAs was also intensified under the CSSM program.

Achievements and Constraints of the District Newborn Care Initiative

The CSSM program was truncated after five years and gave way to the RCH I program. A total of 14 districts were monitored for a period of 12-15 months each. Table 6.4 provides some of the key results. The low NMR and LBW prevalence seen at these facilities was primarily a reflection of poor use of the institutions for newborn care despite program inputs. Only about half the babies were weighed in spite of the availability of weighing scales. Temperature was recorded in only about 15 percent of births in the FRUs and PHCs, and in about 70 percent of babies in the district hospitals. Radiant warmers were used for about half the births and fewer sick neonates. The difference in the NMR between inborn births and referred admissions was striking: 14.6 and 187 per 1,000 live births, respectively. The overall referral rate of newborns was very low and the use of available equipment was suboptimal. Administrative problems, such as the frequent transfer of trained staff with no retraining of fresh appointees and a lack of accountability of the district health managers, contributed to the tardy implementation of neonatal care at the target institutions.

The project did result, however, in sensitizing medical and paramedical staff to the special needs of newborn infants and in promoting breastfeeding. Another major output was the ability to demonstrate the feasibility of using indigenously developed equipment to provide neonatal care. The lessons learned from this initiative strengthened the case for providing further thrust to newborn health interventions in years to come in the RCH program.

Table 6.4 Representative indicators at institutions in 14 districts covered in the District Newborn Care Initiative under the CSSM program (1995-97)

	District Hospital	FRU/PHC
Total births	10,572	19,233
NMR	14.4	13.9
Asphyxia*	6.0%	5.1%
Hypothermia	1.1%	3.1%
LBW	19.0%	15.3%
Referrals		
• Intramural births	0.4%	0.3%
• Extramural births	0.5%	7.2%

* Defined as those needing assisted ventilation at birth
Other details of the CSSM program are discussed in the Chapter 2

The RCH program, phase I

At the conclusion of the CSSM program, the RCH program was initiated in 1997 with major funding from the World Bank. This program was profoundly influenced by the 1995 Cairo International Conference on Population and Development (ICPD) recommendations. The RCH program integrated the SM and CS interventions of the CSSM program into the existing but separate FP program and added RTI/STI interventions. The services were aimed to be client centered, demand driven, high quality, and based on the needs of the community as expressed through decentralized participatory planning and a target-free approach.

ENC as envisaged in the CSSM program continued to be a part of the program. However, the momentum built up during the CSSM days was lost as the program took a long time to take off due to a variety of reasons.

During the implementation of the program, the Government of India approached the NNF to operationalize districts for newborn care. The strategies included a two-day training of providers and the provision of equipment at facilities.

TBA training was not a component of the program initially, but was later introduced in 142 districts in 15 states where over 75 percent of deliveries were by untrained attendants.

IMCI / IMNCI

India is in the early stage of implementation of this strategy, modified in India to emphasize the newborn as IMNCI. The country adaptation is complete, pilot projects are underway, and plans to introduce IMNCI into the RCH II program are being developed.

Country adaptation and implementation

The adaptation committee appointed by the Government of India completed the task of adapting the generic technical guidelines earlier in 2003. The most significant modification is the inclusion of the 0-6 day age period. The IMCI technical guidelines and training modules developed in India are unique in many ways (Table 6.5).

Table 6.5 Differences between generic IMCI and India IMNCI

Features	Generic IMCI	India IMNCI
Coverage of 0-6 days (early newborn period)	No	Yes
Training days for newborn and young infant	2 of total of 11days	4 of total of 8 days
Sequence of training	First, child (2 mo-5 yr); then young infant (7 days-2 mo)	First, newborn and then young infant (0-2 mo); child (2 mo-5 yr)
Home visit module by provider for care of newborn and young infant	No	Yes
Home-based training	No	Yes

The chart book and facilitators guide have been revised. A unique feature of IMNCI is the provision of home visits by the provider for preventive, promotive, and referral/curative service for newborns. A module on home-based training has been developed.

The physicians' module has been field tested in two workshops and is ready for dissemination. The training period has been reduced from 11 days in the generic version to 8 days in the Indian module.

The Indian IMNCI protocol has also been adapted for health workers like ANMs and AWWs. The health workers' module is relatively simple and needs translation into local languages. Two field test workshops have been held so far, and the module is currently being finalized.

The IMNCI training package is being introduced in the UNICEF-sponsored Border District Cluster Strategy (BDCS) in six districts, the first application of IMNCI in a program setting. The lessons of this pilot experience will be of immense importance to the future scaling up of this strategy in the country. The newborn and child health strategy in RCH II incorporates IMNCI as the core approach.

Other initiatives

CARE, SWACH and WHO/SEARO developed and field tested a five-day adaptation of the generic IMCI protocol for basic health workers.

In a WHO-supported project, 288 AWWs were trained using the five-day module in four districts in Haryana. The experience showed that the skills of AWWs in case management of sick children can be enhanced. It emerged clearly that the initial training needs to be reinforced by ongoing supportive supervision in order to build and sustain an optimum level of proficiency in applying the IMCI approach in practice. Equally important is the need for ensuring IMCI drugs and supplies.

A study from Delhi evaluated the utility of the generic IMCI algorithm (2 months to 5 years) in an outpatient and emergency room setting of a medical college among 203 children (2 months to 5 years). It was observed that the co-existence of morbidities was frequent and severe illness was assessed with high sensitivity and specificity.[5] In the second study at the same center the evaluation of the young infant (1 week to 2 months) algorithm showed that three-fourths of subjects (n=129) had more than one morbidity.[6] The sensitivity to identify serious bacterial infection was high (96.1-96.5 percent) but the specificity was relatively low (51.8-59.7 percent). The two important conditions identified for possible refinements were upper respiratory infections and breastfed stools.

In a project sponsored by WHO, four medical schools in the country are currently implementing a pre-service IMNCI training program for undergraduate medical students. Six to eight teachers from each site underwent training in IMNCI, and a training plan and student handbook were developed. The first batch of students is presently undergoing instruction in IMNCI at these colleges.

The Indira Gandhi National Open University in Delhi has introduced IMNCI in the Postgraduate Diploma in Maternal Child Health course. This course consists of written instruction and hands-on practical sessions under the supervision of academic counselors. IMNCI modules have been incorporated into the course materials. Recently, two satellite-linked teleconferences were organized to train the academic counselors at 26 centers.

A study has just been concluded by Action Research and Training for Health (ARTH), an NGO working in Udaipur district in Rajasthan to assess whether counseling by using the generic IMCI led to improved care-seeking behavior by the caretakers.[7] Physicians of six PHCs were given a six-day training in an adapted version of the generic IMCI, and six other PHCs were selected as controls. It was observed that the training improved the counseling and care management skills of physicians. The initiative also led to a modest improvement in care-seeking behavior by caretakers for subsequent episodes of severe illness. Thus, while IMCI made a positive change in family behaviors, the need for supplementing this counseling effort by additional approaches was underlined.

Comment

The Indian version of IMCI is centered on the newborn in recognition of the epidemiologic truth that neonatal health interventions are crucial to making a dent in child mortality. As India moves towards implementation of IMNCI on scale, it is important to ensure that the health system component of the strategy is developed, evaluated, and implemented concomitant with the training activities. The multi-country evaluation of IMCI has shown that health system constraints are detrimental to the effectiveness of IMCI approach.[8] IMCI/IMNCI incorporates evidence-based interventions but requires the effective delivery system of a reasonably well-functioning health system to work. Some key ingredients of the health system relevant to IMNCI include: round-the-clock availability of staff, drugs, and supplies; minimum norms and standards of care at facilities; and a well-functioning supervisory monitoring and evaluation system. Matching BCC strategies are required to ensure demand generation.

RCH Program, Phase II (2005-10)

The next 5-year phase of RCH program (RCH II) will be launched in 2005. Apart from the country funds, this phase of the program would be partially supported by developmental assistance from the World Bank, DFID, and some other donors.

Neonatal health is recognized as the key to child survival in the RCH program. It is fortunate that India's SM and child health initiatives strategies are already integrated into the broad umbrella of the RCH program. It has ensured a spontaneous, controversy-free synergy between the SM and CS strategies. This arrangement benefits the neonate who receives complementary interventions from both components of the program.

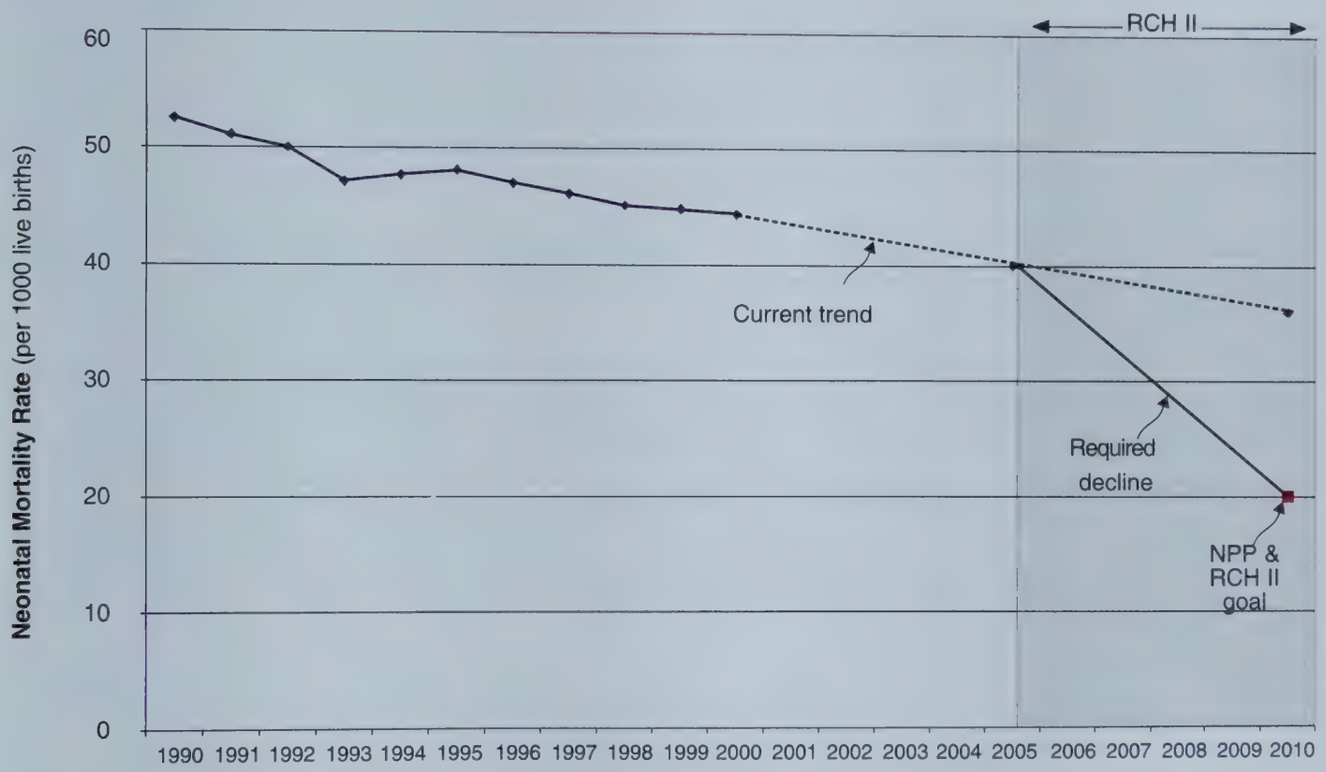
The goals of maternal and newborn health strategies in RCH II are shown in Table 6.6.

Table 6.6 Goals for RCH II (2005-10)

Maternal health	Newborn and child health
• Reduce MMR to <100 by 2010 • Achieve 80% institutional delivery rate by 2010	• Reduce IMR to 30 by 2010 • Reduce NMR to <20 by 2010

The importance of RCH II for the future of maternal and neonatal health is immense. RCH II (2005-10) is the stepping stone for the nation's quest for the NPP goals for 2010 and the MDGs for 2015. The country expects RCH II to be a turning point in newborn survival (Figure 6.1).

Figure 6.1 NMR trends and the RCH II program



The program details are being finalized at the time of preparing this report. The outline of newborn health interventions is shown in the Table 6.7.[9]

Table 6.7 Proposed newborn health interventions in RCH II

Level	Interventions	Key players
Home and community level	**ANC** Focus to be on enhancing coverage among the poor and marginalized women, improving quality, and promoting institutional deliveries, birth preparedness and care seeking for danger signs.	ANMs, AWWs
	Skilled care at birth Institutional deliveries to be promoted through Janani Suraksha Yojana involving TBAs; deliveries by ANMs to be encouraged; piloting community skilled birth attendant SBA (C-SBA) program to be completed; in populations where access to skilled birth attendants or institutional deliveries not available, clean deliveries by trained TBAs to be accepted.	ANMs, C-SBAs, TBAs
	Home-based newborn and post-partum care Using IMNCI protocol, AWWs to provide home-based care to neonates with emphasis on warmth, breastfeeding, prevention of infection, extra care of LBW infants, early detection of sickness; at least three contacts in the first week of life stipulated starting with the first day; extra contacts for LBW and sick neonates; maternal post-partum care also provided. AWWs to involve TBAs to reach neonates and mothers and promote healthy family practices; ANMs to supervise, especially the care of LBW and sick babies and mothers.	AWWs supervised by ANMs; TBAs
	Community-based management of sick neonates Using IMNCI protocols, ANMs to assess neonates with sickness and manage mild / moderate sickness.¶	ANMs
	Referral of sick mothers and neonates Funds for referral transport to be made available at village level, communities to be encouraged to map facilities and develop mechanisms, AWWs and TBAs to facilitate referrals.	Families, communities, AWWs, TBAs
	Behavior change communication (BCC) BCC strategy to aim at promoting early and complete ANC, institutional deliveries, birth preparedness, recognition and early care-seeking for maternal and neonatal danger signs, healthy newborn and maternal care practices.	Community, media, ANMs, AWWs, TBAs
Facility level	**PHCs / CHCs** • 50% Fifty-percent of PHCs (PHCs (~11000) and all CHCs (~600) to be upgraded to provide: 24 hour *basic* emergency obstetric careEmOC and inpatient care to inborn and outborn sick neonates and children; outpatient IMNCI to be implemented; role in antenatalin antenatal and post-partum care tocare to be strengthened. • Rest of the PHCs to provide antenatal careANC, outpatient IMNCI and post-partum care.	Nurses*, ANMs, LHVs, MOs ANMs, LHVs, MOs
	FRUs About 2000 FRUs will be operationalized to provide: 24 hour *comprehensive* emergency obstetric servicesEmOC and inpatient care to inborn and outborn sick neonates and children; outpatient IMNCI to be implemented.	Nurses*, MO, obstetricians, anesthesiologists and pediatricians.
	Private sector Mechanisms to be developed to enable women below poverty line to receive emergency obstetric careEmOC from the private sector; skills of private providers to be enhanced for newborn care	Private physicians

+To be implemented in about 50% districts
*Continuous nursing coverage will be ensured by hiring nurses on contract
¶A proposal to permit ANMs to administer injection gentamicin is under consideration

The newborn health strategy in RCH II envisages a continuum of care from antenatal to postnatal periods, from maternal health interventions to neonatal interventions, and from home care to the facility-based management.

A key objective in RCH II is to promote institutional deliveries as enunciated in the NPP (2000). To achieve this, half of all the PHCs and all CHCs will be operationalized for providing round-the-clock basic emergency obstetric servicesEmOC along with care of inborn and sick neonates. All FRUs will provide comprehensive EmOC along with more advanced care of inborn and sick neonates.

Unlike the CSSM and RCH I programs, in RCH II, a comprehensive community-based newborn health strategy will be taken to scale. Recognizing the importance of reaching neonates in home settings, especially in the first three days of life, a home-based IMNCI approach is proposed to be implemented in about 50% districts by 2010—involving the AWWs of the ICDS system, under supervision of the ANMs. This would be backed by behavior change and community mobilization efforts to improve household practices and care seeking. Community-based organizations such as PRIs, women's groups, and NGOs will be involved for all the components of the RCH program.

The TBA is seen as an important community resource. Her reoriented role will be that of a mobilizer and facilitator for institutional deliveries under the JSY, and of a partner of the AWW and ANM in providing home-based newborn care. In populations where access to SBAs or institutional deliveries is not available, safe and clean deliveries by TBAs will continue to be supported through training in relevant geographic areas.

India presents diverse scenarios of reproductive and child health challenges in different parts of the country. IMR, NMR, MMR , total fertility rate (TFR) and other cardinal health indicators vary considerably in different states and districts. For instance, the NMR of Orissa (61) is nearly six times that of Kerala (10) and twice that of West Bengal (31). Health system capacity and effectiveness also varies immensely from state to state. Accordingly, RCH II program recognizes a differential approach to program depending upon the local problems, priorities, and capacititesy. States will develop and implement individual RCH II plans within the broad generic framework highlighted above.

Under the urban RCH component of the program, states would submit proposals for respective urban areas. There is also a draft proposal to strengthen newborn, child, and maternal care services at government run teaching institutions.

The process indicators of relevance to newborn health include: proportion of neonates (and mothers) receiving 3 visits by a provider within the first week of birth (—with one visit within 24 hours at home or after discharge from the facility for institutional deliveries), —and proportion of neonates with sepsis in the previous 4 weeks who received appropriate medication as per IMNCI protocol.

Equity considerations are at the core of RCH II program. Families that are living below the poverty line, scheduled caste, and scheduled tribe will be specially targeted. EAG states with large populations, poor indicators, and high burden will receive special support. The program also aims to address key health system issues—institutional strengthening, improved fund flow mechanisms, human resources deployment, improved procurement and supplies, and intra- and inter-sectoral convergence in particular.

With a comprehensive emphasis on perinatal-/neonatal health, the RCH II program has the makings of a watershed for newborn survival and health in the country.

7 Newborn Health Initiatives

The Neonatal Resuscitation Program

The American Academy of Pediatrics (AAP) and the American Heart Association (AHA) introduced the National Resuscitation Program (NRP) in the late 1980s to disseminate standard resuscitation guidelines among physicians and nurses. The program consisted of a structured self-reading manual, a hands-on workshop using mannequins and resuscitation equipment, a certification process, and standardization of instructors and the instruction process.

The NNF approached a team of US neonatologists of Indian origin under the aegis of the Physicians for Perinatal and Pediatric Care to organize the first trainers' workshop at Manipal in 1990. The 27 members of the national faculty on resuscitation, thus trained, were grouped into five teams, given one mannequin each (donated by the US trainers), and given the responsibility to organize workshops in their respective regions. This was the humble start of the largest NRP program in the developing world. Soon financial aid came in from the Government of India, and the Laerdal Foundation of Norway donated 15 sets of mannequins. The NNF organized two more trainers' workshops in 1991 and 1992, and a contingent of 142 national trainers was ready. During the initial three years of the program, the NNF organized 233 workshops resulting in the training of 10,080 physicians, nurses, and others in all parts of the country.[1] By now, thousands of workshops have been conducted. Every corner of the country has been covered, thanks to the enthusiasm of the trainers and the zeal of the champions in the rank and file of the NNF state chapters.[2]

The most important impact of the NRP program is that it brought conspicuous visibility to newborn health. The successful implementation of this program triggered the NNF's association with the government that led to a partnership for the CSSM program (1992-1997). The NRP has remained an integral part of the training program under the CSSM and RCH programs.

Another important effect of the NRP movement has been on the indigenous production of resuscitation equipment, especially silicone self-inflating bags. In 1990, no standard resuscitation bags were being manufactured in India, but now several brands of indigenous resuscitation bags of high quality are readily available at an affordable cost (US$35-50). The demand for resuscitation equipment is an indirect indicator of awareness about rational neonatal resuscitation practices.

As most of the trainers belonged to medical schools and nursing colleges, the NRP has been included in the teaching curriculum of their respective institutions. This has ensured that future health professionals are equipped with adequate knowledge and skills of neonatal resuscitation. Besides pediatricians and general doctors, the target providers for the program have been nurses, obstetricians, and anesthetists. The adapted versions of the NRP modules in local languages have been employed for the training of ANMs and TBAs. The NRP has stimulated the standardization of equipment and facilities in delivery rooms

In 1997-1998 a study was conducted at 14 teaching hospitals to assess the impact of NRP training on newborn mortality.[3] The institutions, selected randomly, had no previous neonatal resuscitation program.

Two members of the faculty from each center were given NRP training, and they in turn trained all the residents and nursing staff in their respective institutions. Each participating center provided 3 months of pre-intervention and 12 months of post-intervention data. The introduction of NRP significantly increased awareness and documentation of birth asphyxia, and a significant shift toward more rational resuscitation practices was witnessed as indicated by a decline in the use of chest compressions ($P<0.001$) and medication ($P<0.001$), and an increase in the use of bag-and-mask ventilation ($P<0.001$). Although the overall neonatal mortality did not decline, asphyxia-related deaths decreased significantly (Table 7.1).

Table 7.1 The impact of the NRP training at 14 teaching institutions[3]

Outcome	Neonatal deaths	
	Pre-intervention (Births=7070)	Post-intervention (Births=25713)
Overall mortality	264 (3.7%)	901 (3.5%)
Cause-specific mortality		
• Asphyxia*	111 (1.6%)	283 (1.1%)
• Immaturity	74(1.0%)	257 (1.0%)
• Sepsis	37 (0.5%)	183 (0.7%)
• Malformations	28 (0.4%)	103 (0.4%)
• Others	14 (0.2%)	75 (0.3%)

* P<0.001

A singular achievement of the neonatal resuscitation program initiative is the nationwide sensitization of policymakers, providers, and other stakeholders to the prime importance of neonatal health. This has been possible due to the involvement of the national faculty on neonatal resuscitation with unstinting support from the leadership of the NNF of India, which has promoted this movement as its key program over the years.

National Neonatal Perinatal Database (NNPD)

This is a unique development in neonatal health in India. An expert group meeting on Neonatal Nomenclature and Data Collection organized by the NNF in 1988 recommended establishment of a network of institutions to provide neonatal-perinatal data on a common protocol. The methodology and tools were finalized at a workshop sponsored by the Ministry of Health and Family Welfare in 1994, and in 1995, 16 leading institutions volunteered to be a part of the database network, supported by modest funding from the NNF. Information on 38,592 neonates born at these institutions was documented.[4,5] The initiative was revived in 2000, and this time, in addition to the 16 centers which provided information on inborn newborn neonates, 10 centers provided data on outborn neonatal admission.[6-9] Since 2001, the Indian Council of Medical Research (ICMR) has been funding the network, which now consists of 19 institutions.

A comparison of key neonatal health indices from 10 centers, which provided data in 1995 as well as 2000, showed a significant improvement in neonatal outcomes, reflecting a positive change in newborn care at these institutions.[10]

The NNPD initiative is the largest study on newborn health at tertiary level institutions, and since 2002, the largest at the secondary level. This is the largest neonatal network outside of a few developed countries, encompassing 69,211 births during 2002. The insights provided by the database to the clinicians, academicians, and researchers are immense. The participating institutions use the data for quality improvement, and even though the data is hospital-based, it helps policymakers set in priorities.

The data for 2002 is under analysis.[11-13] A risk model for predicting adverse outcomes was developed, and participating centers were compared using this risk-model.[14] The tentative results for the year 2002 are summarized in Table 7.2.

From this year onwards, a new network has been added to the NNPD network. A total of eight Human Reproduction Research Centers of ICMR are providing data on morbidity, mortality, and the health care profile of neonates at district and subdistrict hospitals.

The most important aspect of this initiative lies in its future potential. The NNPD network, especially since it received a generous capacity-building support from the ICMR, has emerged as a research asset. The participating institutions and the nodal center have perfected the system of multicenter collaboration, and the network is poised to launch multicenter clinical studies in the near future. Initiating intervention studies is also being proposed to develop and pilot models of optimum newborn care at secondary level institutions and to conduct community-based operational research through this initiative in the long run.

Table 7.2 Salient observations on neonatal morbidity and mortality at 16 institutions in 2002[11]

Variable	n	Proportion
Births		
• Live births	66512	
• Stillbirths	2699	
• LBW	21041	31.6%
Deaths		
• Neonatal	1800	
Early (< 7 days)	1605	89.2%
Late (7–27 days)	195	10.8%
Perinatal statistics		
• SBR (per 1000 births)	39.0	
• NMR (per 1000 live births)	27.0	
Early	24.1	
Late	2.9	
• PMR (per 1000 births)	62.1 (4499/69211)	
Cause of neonatal deaths (n=1800)		
Asphyxia	517	28.7%
Sepsis	263	14.6%
RDS	243	13.5%
Malformation	168	9.3%
Prematurity	165	9.2%
Others	444	24.7%
Morbidity incidence* (n=66512)		
Hyperbilirubinemia	2213	3.3%
Asphyxia (5 min Apgar <7)	2211	3.3%
Hypoxic ischemic encephalopathy	1062	1.6%
Hypoglycemia	1058	1.6%
Malformations	1058	1.6%
Meconium aspiration syndrome	888	1.3%
RDS	788	1.2%
Seizures	743	1.1%
Polycythemia	668	1.0%
Pulmonary air leak	174	0.3%
Retinopathy of prematurity	146	0.2%

* Not mutually exclusive

Newborn Care Training in Selected States

Orissa

Orissa has one of the highest IMRs in India. In 1997, the government of Orissa, with the help of UNICEF, initiated a program to impart training to physicians in ENC. AIIMS developed the training materials and coordinated the training of trainers. Between 1997 and 1999, a total of 5 zonal workshops, 2 trainers' workshops, and 14 district level workshops were conducted. Almost all the pediatricians working in the district and subdistrict facilities in the state were covered.

A follow-up initiative, "NALS on Wheels," was launched in Gajapati and Ganjam districts in 1999. In this program—supported by the American Association of Physicians from India (AAPI), UNICEF, and the government of Orissa—a group of trainers travelled in a vehicle from place to place to train providers in ENC. Through a total of 40 workshops, 180 physicians at the PHCs and 723 ANMs were trained.

An important outcome of this initiative was the establishment of several newborn care corners at government facilities.

West Bengal

Taking its cue from the Orissa initiative, the West Bengal chapter of NNF, with assistance from UNICEF and the state government, embarked on a massive training effort for physicians, ANMs, and TBAs. Two trainers' workshops were organized in 1998. The Orissa training materials were used, and an ANM module was prepared in Bengali. Between 1999 and 2002, a total of 965 physicians, 2484 nurses, 1,576 TBAs, 1,178 health workers, and 1,374 registered medical practitioners were trained through 195 workshops in 17 of the 19 districts of the state.[15] In addition, a total of 98 village meetings were organized, covering 3,350 opinion leaders to elicit community participation for newborn health. Using improvised equipment (including a thermocol box for warming, cut plastic saline bottle as a face mask, a 200-watt bulb as radiant heat source, and locally improvised cots), newborn care corners were established in many facilities. A new phase of newborn care training supported by UNICEF is now underway.

Madhya Pradesh

Madhya Pradesh took the lead from Orissa and West Bengal. UNICEF organized three training-of-trainers workshops in collaboration with AIIMS and the state chapter of NNF in 1999-2000. State-wide satellite-based distance learning sessions on newborn care were also conducted by the state faculty.

Breastfeeding Practices and Promotion

Exclusive breastfeeding (EBF) for the first six months of life is the ideal nutrition for the infant irrespective of gestation, birth weight, place, and mode of delivery.[16,17] EBF has been recognized as the most effective intervention to reduce child mortality.[18]

Trends of infant and young child feeding practices

The NFHS report (NFHS-I;1992-93) showed that 51 percent of infants were exclusively breastfed during 0-3 months, and 26 percent at 6 months (Table 7.3).[19] The study showed that in the 0-3 months age group, 22 percent received breast milk plus water, and 23 percent received breast milk along with other liquids like milk, juice, or soup. In 1998-99, NFHS II revealed a small increase in EBF rates among infants 0-3 months.[20]

In a study by the Breastfeeding Promotion Network of India (BPNI) from 98 blocks in 49 districts (of 25 states and 3 union territories), the EBF rate during 0-3 months was estimated as 55 percent.[21]

Table 7.3 Key indicators of breastfeeding practices

Parameter	NFHS I[19] (1992-93)	NFHS II[20] (1998-99)	BPNI Study[21] (2000)
Initiation of breastfeeding within 1 hr	10%	16%	28%
EBF0-3 months	51%	55%	55%
EBFat 6 months	20%	19%	

Interventions to support breastfeeding

Maternity Leave and Other Benefits

The Fifth Pay Commission (Government of India) has recommended an increase in paid maternity leave from 90 days to 135 days for the mother and the introduction of 15 days of paternity leave for fathers. The central government and many state governments have implemented these recommendations.

National Mechanisms for Promoting Breastfeeding

In 1997 a 14-member National Breastfeeding Committee was constituted with a Joint Secretary (Child Development), Department of Women and Child Development, as the convener and chairperson. A draft action plan on infant and young child feeding for the Government of India is being developed.

Baby Friendly Hospital Initiative (BFHI)

This movement started in 1993 and generated interest in breastfeeding within the health care system. The aim was to follow "Ten Steps to Successful Breastfeeding" in order to help and support women to succeed in EBF during hospital stays as well as after discharge. There are about 1,400 certified "Baby Friendly" hospitals in India. Some states like Maharashtra and Tamil Nadu have started certifying hospitals as Mother and Child Friendly Hospitals.

The program was revived in 2001, and an Apex committee has been constituted, headed by the Secretary of the Family Welfare Department, Ministry of Health and Family Welfare. Action plans are expected to be developed in the near future.

A study compared BFHI-certified hospitals with those without certification (Table 7.4).[21] There was no difference in the duration of EBF of the babies belonging to the two categories of hospitals. The training of health workers in lactation and breastfeeding management seemed to be the key factor, but was found to be grossly inadequate in both the groups.

Table 7.4 The impact of Baby Friendly Hospital certification on breastfeeding practices

Parameter	BFHI-certified hospitals (n=306)	Non-certified hospital (n=294)
Initiation of breastfeeding within 1 hour	54.5%	36.5%
Prelacteal feeds	16%	34
Supplements in the hospital	7%	17%
Use of pacifiers	5%	7.5%
Antenatal discussion about breastfeeding	53%	44%

The Infant Milk Substitutes, Feeding Bottles, and Infant Foods (Regulation of Production, Supply and Distribution) Amendment Act, 2003

The Infant Milk Substitutes, Feeding Bottles, and Infant Foods (Regulation of Production, Supply and Distribution) Act (the IMS Act) was enacted in 1992. The act did not ban the sale of products under its scope, but aimed to strictly regulate marketing and promotion of the products. It prohibited the promotion of "infant milk substitutes" (IMS) while permitting the promotion of complementary foods, which were dubbed "infant foods" (IF) under the act. It aimed to curtail misinformation and the misdirected "education" of pregnant women and mothers of infants about breastfeeding. Significantly, the act prohibits the payment of incentive-based wages to employees of the manufacturing companies.

Recently the IMS Act was amended to include key features like banning any kind of promotion of infant food for children under the age two, banning the distribution of gifts by the manufacturers of IF and IMS, banning the use of the health care system for promoting IMS and IF, and banning support to health workers or their associations. It is being viewed as an effective step in protecting the rights of mothers and children by plugging hospitals which were not included in the original act. The act came into effect in June 2003.

Initiatives by the Ministry of Information and Broadcasting (MIB)

In 2000 the MIB banned the promotion of IMS, IF, and feeding bottles over television. The step will have its impact on the population in the decades to come.

Tenth Five-Year Plan 2003-2007

The 10th Plan recognizes the need to increase EBF rates to 80 percent during 0-6 months and also enlists promoting EBF as the key preventive strategy to tackle malnutrition in children under three. The states of the country are expected to take action, but advocacy is needed at the political as well as the policy level to accord priority to EBF.

NGO initiatives

BPNI, the IAP, and the NNF have been in the forefront in the field of advocacy, information sharing, and monitoring the compliance and training of health workers. BPNI and the Association for Consumer Actions on Safety and Health (ACASH), a Mumbai-based NGO, have been playing a role in monitoring the compliance and also initiating legal action against the companies that violated the IMS Act. New areas of action are underway, such as intervention projects at the community level in some parts of India.

Promotion of Breastfeeding by Grassroots Workers

One of the key assignments of an AWW is to promote and support breastfeeding in order to improve the nutritional status of preschool children. A recent study revealed that the promotion of EBF is possible by a team of grassroots workers (TBAs, AWWs, and ANMs) through ongoing counselling during all possible contacts with the mothers, including home visits.[22]

Comment

EBF for the first six months decreases morbidity and mortality and supports adequate growth in infants. There is an urgent need to educate the opinion makers, providers, and families about the recent recommendation of EBF for six months (and not four months as promoted earlier). The practice of supplementing breast milk is common in India, and this practice needs to be curbed. There are efforts by NGOs as well as government agencies to protect, promote, and support breastfeeding, but there is still a very long way to go.

Border District Cluster Strategy (BDCS)

Since 1999 UNICEF has been providing support to the policies and strategies of BDCS, an initiative spearheaded by the Government of India and state governments for the purpose of developing new models and tools to support the implementation of the national RCH program in some of the poorest districts of the country. Under this initiative, innovative health strategies designed to reduce the unacceptably high levels of maternal, infant, and child mortality and malnutrition in selected marginal border districts are being piloted over a four year period (2002- 2007). The project covers approximately 92 million people in 49 districts, out of which 6.6 million are under 3 years of age, 11 million are under 1 year of age, and 2.1 million are pregnant women.

A growing component within the BDCS is the Integrated IMNCI, which was designed in 2002–03 by a of experts—the National Indian Adaptation Group—constituted by the Government of India in collaboration with UNICEF, WHO, academic institutions, and major stakeholders. A second area of intensified focus pertains to Safer Motherhood in India, which aims to achieve quality of care for women and newborns. The objective of this component is to reduce maternal and neonatal mortality and morbidity and LBW through the provision of a comprehensive mother/baby health package. Closely linked to the above two components is the Immunization Plus initiative to increase children's access to multiple antigen immunization and vitamin A supplementation in select districts or blocks in the north, as well as in other states presently performing below par.

For UNICEF, maternal and infant mortality reduction is both an output and an entry point for addressing key strategic issues associated with children's and women's rights issues in India. Good antenatal, intranatal, and postnatal care for the mother and neonate, together with ongoing access to information on home care for the pregnant and lactating mother and newborn baby, are the major priorities for the BDCS initiative in India. Ongoing access to routine immunization for the young infant and the availability of nutritious foods and micronutrients throughout the life cycle are also fundamental.

UNFPA's Program on EmOC

The UNFPA's Sixth Country Program (CP6) of support to India for the period 2003-2007 has been designed with a concrete output and result focus. Seventy-five percent of the total US$75 million program allocation has been earmarked for improving reproductive health service access and quality in 32 districts of Maharashtra, Rajasthan, Gujarat, Madhya Pradesh, and Orissa, with support for post-fertility decline policy issues in Kerala. Of the seven major service-related outputs of the program, a key output is to meet the demand for EmOC.

The focus of the output on EmOC is in consonance with the national and state policies of reducing maternal mortality and morbidity. It has a three-pronged emphasis: (1) influencing policies including increasing the availability of service providers such as anesthetists and the availability of blood at subdistrict levels; (2) improving the availability, accessibility, and quality of services; and (3) addressing community-level constraining factors including gender imbalances and myths and misconceptions to ensure the uptake of available services.

This three-pronged strategy is based on the experience gained in Rajasthan through the Columbia University-supported AMDD project. Considering the low availability of gynecologists and anesthetists at the subdistrict level, the Government of Rajasthan, with input from UNFPA, initiated a training program to improve the skills of MBBS doctors and those of their support staff in basic EmOC. As per a recent independent assessment, this team-based training has shown significantly improved skills and confidence

among providers to attend to basic obstetric emergencies, decide on timely referral of cases to higher levels, and improve recording of information to report on UN process indicators on maternal mortality.

The skills development was supplemented by facility enhancement in terms of improved infrastructure with adequate equipment, supplies, privacy arrangements, running water, and waste disposal. Toward the goal of improved service quality, training in improved infection prevention practices, waste disposal system for quality assessment, and enhancement were also undertaken.

As availability of services alone is not sufficient to ensure a higher demand for services, community empowerment initiatives to enhance knowledge among Panchayat members, key village leaders, NGOs, and the media on the danger signs during labor that require institutional care, have also been undertaken. These measures, in a short span of 30 months, have increased the met demand for EmOC services from 8 to 14 percent—a 40 percent increase.

The above measures—along with policy inputs for increasing blood availability at subdistrict levels, the training of providers in administering anesthesia, and establishing quality assurance systems—will ensure increased availability of services. This could result in enhanced utilization, eventually meeting the demand for EmOC and contributing to the state and national goals of lowering maternal mortality.

Promoting Newborn Health in Urban Slums of Indore

This project, supported by USAID (Environmental Health Project), aims at promoting neonatal health and survival in the urban slum population of Indore in Madhya Pradesh.

In Madhya Pradesh, the NMR for the urban poor is 69.7 per 1,000 live births compared to the urban average of 44. The proportion of mothers receiving at least two doses of TT is as low as 55 percent verus the urban average of 73.7 percent, and the proportion of deliveries attended by health professionals is 38 percent to 65 percent respectively. The slums in Indore pose challenges of limited availability and access to basic health services.

Technical assistance for the promotion of newborn care in the slums of Indore aims to enhance the use of newborn care services as well as increase adoption of optimal newborn care behaviors through increasing the capacity of program partners, mechanisms for convergence of service providers, and BCC strategies.

The approach of this project is to involve stakeholders at various strata, including the city (immunization officer, civil surgeon), cluster (NGO workers, ANMs, community leaders), basti (NGOs and lead community-based organizations), and family (basti community-based organizations and health volunteers) levels. The community level implementation is carried out through the NGO and community-based organizations partnership.

The aim is to build the capacity of these civil society organizations with support from the different strata of stakeholders to implement and sustain the technical interventions. These include delivery of ANC, TT immunization, promoting birth preparedness, clean delivery practices, institutional deliveries where appropriate, immediate newborn care, postnatal visits, and referral for sick newborns. The project envisages a health information system for monitoring and tracking services. The project is in the sixth month of implementation.

8 Stakeholders and Partners

The National Neonatology Forum

The NNF was started by a handful of leading pediatricians working in the field of neonatology in the year 1980. It has the following objectives: to encourage and advance the knowledge, study, and practice of the science of neonatology in the country; to draw out recommendations for neonatal care at different levels; to establish a liaison with other professionals concerned with neonatal care; to assess the current status of electronic equipment being used in the country for perinatal care; to promote the indigenous manufacturing of equipment; to develop a neonatal component of the curriculum for medical as well as nursing teaching; and to organize conferences, trainings, and workshops to promote neonatal care in the country.

The NNF currently has over 2,500 members, consisting mostly of pediatricians but also with a few nurses and others. Its 10-member governing body, with a mix of elected and nominated members, steers the activities for a two-year term. There are 18 state chapters organized on similar lines. In order to ensure progress in priority areas, the NNF has established subcommittees on various subjects, including research, curriculum, nursing, equipment, and accreditation. The NNF publishes a quarterly mouth piece, *The Journal of Neonatology*.

The NNF has been organizing numerous continuing education activities nationwide. The annual conventions held in different cities are prime events for workshops, symposia, and discussions of national issues. At these conventions, special educational events are organized for nurses to promote neonatal nursing.

The NNF has a program of accrediting newborn units in India.[3] It has developed technical guidelines on neonatal monitoring, equipment, ventilation, and nursing, among others. Recommendations on undergraduate and postgraduate medical and nursing education have also been developed and disseminated. The NNF faculty developed standard text and teaching slides on key newborn care topics for medical students and physicians. In 1991-92, the NNF organized a four-week in-service training for over 140 physicians and nurses at 22 accredited centers with funding from the government. The NNF ran a vibrant international exchange program in collaboration with Physicians for Pediatric and Perinatal Care (USA).

A notable program of the NNF – one that has had countrywide impact — involves the dissemination of neonatal resuscitation skills. The Neonatal Advanced Life Support (NALS) training program, later called the Neonatal Resuscitation Program (NRP), was launched in 1990 at Manipal. A faculty of over 150 was trained in a phased manner to lead the initiative. They and others have conducted thousands of workshops on neonatal resuscitation in all parts of the country for nurses, general practitioners, pediatricians, and obstetricians, employing the AAP protocols and a highly popular hands-on teaching-learning strategy using mannequins.

In 1995 the NNF established a network of 16 leading institutions, the NNPD, which provides hospital based information on newborn morbidity and mortality and forms a nucleus for multicenter collaborative research. In recognition of its importance, the NNPD is now being supported by the ICMR.

The NNF and national programs

Although the NNF started as an organization of pediatricians of tertiary care institutions to promote neonatology, it soon became, in addition, a catalyst for advancing newborn health in the country. Its able leadership could visualize the need for the expansion of newborn care beyond the nurseries in hospitals. The NNF prepared the first set of recommendations on neonatal care in India back in 1980. In 1982 a task force on Minimum Perinatal Care, with the participation of the NNF and the Government of India, envisaged that "Level I care will be imparted through the trained TBAs and female health workers in the community."[4] In the years to follow, several members of the NNF were to experiment with community-based projects on newborn care; training TBAs, health workers, and nurses; developing small hospital newborn care models; using of the workers of ICDS for newborn care; and simplifying the technology of newborn care to suit low-resource settings.

By the early 1990s, the successful implementation of the UIP had led to a steep decline in NNT and thereby a big drop in neonatal mortality. NNT, responsible for 350 thousand deaths annually (accounting for 25-33 percent of all neonatal deaths until the early eighties), was virtually eradicated in just over a decade. And by this time, the NNF had succeeded in putting newborn health beyond tetanus elimination and firmly on the national agenda through sustained advocacy and its reputation. As a result, in 1992, at the time of formulating the national CSSM program (1992-1997), it was decided to include ENC as one of the components of the child survival strategy (along with immunization, management of diarrhea and pneumonia, and vitamin A prophylaxis) for the first time. The NNF assisted the government in developing the ENC package, consisting of resuscitation, prevention of hypothermia and infection, exclusive breastfeeding, and referral of sick newborns.[5] The focus of ENC services in the CSSM program were the district, subdistrict ,and first level facilities. Two key inputs were made, namely, the training of physicians and the supply of essential equipment. The NNF contributed to the development of training materials and the selection of equipment, and its trainers were responsible for imparting hands-on training and monitoring of the operationalizing process in 30 districts.

The CSSM program gave way to the RCH program in 1997. The NNF was called upon to assist the government to operationalize the ENC package in 80 districts. The NNF developed a new set of training materials and successfully implemented the program against a tight timeline. The NNF faculty has conducted 90 workshops and trained 3,600 physicians and nurses since 2001. The NNF is involved in the design of the next phase (2003-09) of the RCH program. It is widely expected that newborn health will receive a major boost in the RCH II program with home-based newborn care being implemented nationally. The real action has just started and the rank and file of the NNF are ready to rise to the occasion in this national endeavor!

The NNF prepared monographs on primary newborn care, communication strategies for newborn care, and traditional practices in newborn care. It recently developed a training module for basic health workers in collaboration with the Cooperative for Assistance and Relief Everywhere (CARE). Urban newborn care is a new priority for the Forum in coming years. The Forum is assisting the government, WHO, and UNICEF in adapting the IMCI. The draft Indian version of IMCI is known as Integrated Management of *Neonatal* and Childhood Illness (IMNCI), underlining the added emphasis on the neonatal component. The NNF is a member of the National Technical Committee on Child Health, in addition to many other advisory formulations, and is routinely consulted on policy and program issues. Likewise, many state leaders of the NNF are involved in different ways in assisting the respective state governments in newborn care initiatives. The forum actively championed the path-breaking study on home-based newborn care by SEARCH.[3]

In 2000, at the request of the NNF, the government agreed to observe a National Newborn Week from 15 through 21 November each year. The maiden Newborn Week was launched by the Honorable Prime Minister himself on 15 November 2000. This was a notable accomplishment for NNF in more ways than one: it signified the recognition of newborn health as a key national priority; it reflected the political commitment to the cause of newborn infants at the highest level; and it marked the recognition of the government to the contribution and credibility of the NNF. It was indeed a defining and a proud moment for the NNF.

The NNF has emerged not only as an advocate or a catalyst, but also as a close partner of the government in promoting newborn health in India.[2,3] This is a unique accomplishment for a professional organization, resulting from a sustained contribution of the forum over the years in diverse domains ranging from policy to training, from technical assistance to research, from curriculum to equipment, and from networking to action. The credit for this success goes to the vision, teamwork, and commitment of the NNF's leadership, coupled with the zeal, activism, and effort of its members.

The Indian Academy of Pediatrics

In the mid-1940s, there were no more than 12 to 15 pediatricians in the country concentrated mainly in Mumbai, Delhi, Chennai, and Calcutta. The first Department of Pediatrics was started in 1928 at J. J. Hospital, Mumbai, and in 1929 the first independent children's hospital by the name of B. J. Wadia Hospital for Children. In the early 1950s, six or seven more departments of pediatrics were added at various centers in India. With the increase in the number of doctors specializing in pediatrics, two associations emerged for the furtherance of knowledge on the subject, namely the Association of Pediatricians of India in 1950 in Mumbai, started by Dr. George Coelho, and the Indian Pediatric Society in Calcutta started by Dr. K. C. Chaudhary. These two bodies subsequently merged in 1963 to form the IAP with around 140 member pediatricians.

The IAP has grown over the years and now it has more than 14,000 members. It also has 26 state branches and 225 regional, district, and city branches all over the country. It also has 16 pediatric subspecialty chapters, five interest groups, four cells, and an education center.

The business of the Society is carried out through the Central Office in Mumbai. The society has two scientific journals—*The Indian Pediatrics* (monthly) based in Delhi and *The Indian Journal of Practical Pediatrics* (quarterly) based in Chennai—and a quarterly bulletin (in-house magazine) *Academy Today* based in Mumbai, which serve as the main communication channels with members.

Before the development of subspecialties in pediatrics, the IAP had been very active in promoting newborn care in the country as one of its primary aims. Over time, this subspecialty has grown rapidly, and more and more scientific research and academic meets are being organized in the country. To keep pace with ever-expanding horizons in newborn care, the IAP has created an IAP subspecialty chapter on neonatology which caters to the needs of the giver and the receiver of newborn care. The IAP closely collaborates with the government, NGOs, WHO, and UNICEF on issues of newborn care.

The IAP's subspecialty chapter on neonatology organizes scientific meets such as symposia, meet-the-experts sessions, free-paper sessions, and award-papers sessions during the national conferences of the IAP, wherein interested members meet together to discuss various issues involved in newborn health and map out future strategies to meet the challenges ahead for health care providers. To encourage young research scholars under 40 years of age, the academy gives awards for research in neonatology at the annual meeting.

The IAP has a National Committee on Breastfeeding and Lactation Management which also supports newborn care activities. The IAP branches and the local members organize World Breastfeeding Week every

year and thus demonstrate the IAP's commitment to protection, promotion, and support for breastfeeding. During this week, the branches organize lectures and meetings for all the categories of health care providers, political, religious, social leaders, and the lay public; put up posters on breastfeeding; give talks on TV and the radio; and educate the public through publishing articles in newspapers on the benefits and importance of breastfeeding . Programs on breastfeeding are also organized for mothers and students to impart knowledge on the importance of breastfeeding. The professional and service organizations are also involved in this activity. The Central Office of IAP invites entries from the IAP branches and gives awards to those branches judged as best during the national conferences.

The IAP is fully committed to promote the Infant Milk Substitutes, Feeding Bottles and Infant Foods (Regulation of Production, Supply and Distribution) Act (IMS Act) of 1992 and its subsequent amendments and has been reminding all its members and official organs of IAP to abide by the provisions of the IMS Act in letter and spirit.

Federation of Obstetricians and Gynecological Societies of India

The first All India Obstetric and Gynaecological Congress was held in Madras in 1936, organized by the then existing three Obstetric and Gynecological Societies at Bombay, Calcutta, and Madras. At the sixth All India Obstetric and Gynecological Congress held in Madras on 6th January 1950, it was resolved to unite to form the FOGSI to be registered and headquartered in Bombay.

The main objects of FOGSI are to bring physicians practicing in the field of obstetrics and gynecology together and provide an opportunity to express and exchange views freely, to safeguard their interests, to plan undergraduate and postgraduate medical education in obstetrics and gynecology, to help in the orientation and teaching of midwives, auxiliary nurses, and FP social workers, to help upgrade the knowledge of TBAs, to achieve higher standards of scientific progress in the specialty by holding All India Obstetrics and Gynecology congresses, and to publish *The Journal of Obstetrics and Gynecology of India.* Besides these, the Federation also aimed to help improve maternal and child health care, raise the standard of training and practice of doctors, nurses, and paramedical personnel in our country, keep pace and stay abreast of recent knowledge in the field of obstetrics, gynecology, and FP, and ultimately reduce maternal and perinatal mortality and morbidity.

There are to date 144 obstetric and gynecological societies affiliated with FOGSI, with a total active membership of about 15,500 people. All India Obstetrics and Gynecology congresses have been held once every two years since 1936. *The Journal of Obstetrics and Gynecology of India* was started in September 1950 and continued as a quarterly journal until December 1964. From January 1965, the journal was published bimonthly. FOGSI is the founding member of the International Federation of Gynecology and Obstetrics (FIGO), which came into existence in 1954. FOGSI also is a member of the South Asian Federation of Obstetrician & Gynaecologists), a regional federation formed in 1995 and comprised of members from India, Sri Lanka, Pakistan, Bangladesh, and Nepal.

FOGSI was also the founding member of the Asian Federation of Obstetrics and Gynecology in 1959 and hosted the second Asian Congress of Obstetrics and Gynecology in Calcutta in January 1962. FOGSI, directly or indirectly through its members, is working closely with the central government and various state governments, WHO, and UNICEF. In 2000, the President of FOGSI was invited by the Government of India to be on the committee on Population Policy.

FOGSI-Indian College of Obstetricians and Gynaecologists is the academic wing of FOGSI, which was founded in 1984. It is managed by the governing council. ICOG organizes continuing medical education programs and workshops in different parts of India.

FOGSI has 27 committees on various areas such as maternal mortality, perinatal mortality, medical education, medical termination of pregnancy, FP, oncology and fetal medicine, and genetics.

FOGSI is also playing an active role by providing technical assistance to central and state governments and municipal corporations in the effective implementation of reproductive health care for women. Through liaising with different universities and the Medical Council of India, FOGSI is trying to promote a rational curriculum for undergraduate and postgraduate medical students in the field of obstetrics and gynecology and its subspecialties. In partnership with state governments and nursing councils, FOGSI is bringing improvements in the education of midwives and nursing personnel to India.

The Breastfeeding Promotion Network of India

BPNI is a registered, non-profit, independent national organization with international collaboration, working (since 1992) toward protecting, promoting, and supporting breastfeeding and appropriate complementary feeding of infants and young children.

BPNI is a network of individuals, district branches, state branches, and organizations working in the field of infant nutrition. It is:

- The regional focal point for South Asia for the World Alliance for Breastfeeding Action (WABA);
- The regional coordinating center for the IBFAN South Asia;
- A member of the UNICEF NGO Committee;
- A member of the Nutrition Mission, the National Breastfeeding Committee, the National Technical Committee, the National Task Force, and the BFHI;
- A certified NGO (by the Government of India) for monitoring compliance with the IMS Act, 1992.

BPNI works to protect, promote, and support breastfeeding in India through advocacy, training, education, information, research, and social mobilization. Its broad goal is to empower all women to breastfeed their infants exclusively for the first six months of life and to continue breastfeeding for two years or beyond, along with adequate and appropriate complementary feeding. BPNI recognizes the objectives of the National Plan of Action for Children of the Government of India.

BPNI has been working as a catalyst in the breastfeeding movement, promoting optimal infant feeding practices to mobilize countrywide action in collaboration with: government departments, especially the Department of Women and Child, the Ministry of Human Resource Development, the Ministry of Health and Family Welfare, the National Institute of Public Cooperation and Child Development (NIPCCID); UNICEF; WHO; NGOs like the Association of Consumer Action on Safety and Health (ACASH); professional bodies like the IAP, the NNF, the IMA, FOGSI, and the Trained Nurses Association of India (TNAI); international agencies like CARE, the Swedish International Development Agency (SIDA), Linkages, and the Netherlands Ministry for Development and Cooperation (DGIS); and several others.

BPNI also works in close liaison with IBFAN and the WABA. BPNI does not accept funds or sponsorship of any kind from the companies manufacturing infant milk substitutes, feeding bottles, infant foods (cereal foods), or related equipment. BPNI is a member of the National Breastfeeding Committee, the National Technical Committee on Child Health, the Apex Committee of BFHI, and, the NGO Committee of UNICEF. Under the IMS Act, BPNI is the gazetted and notified organization to make a complaint in writing under section 21 by clause (c)(1) for any violation against this act.

The National Coordinator of BPNI is the member expert in the National Nutrition Mission (NNM) of the Government of India, headed by the Prime Minister, to give policy direction and coordinate its nutrition

programs. The NNM will function under the Human Resource Development Ministry and will review and revise the goals set out in the NNP (1993) and the National Plan of Action on Nutrition (1995).

BPNI is a pioneer in counselling and training in breastfeeding, complementary feeding, and HIV/infant feeding to health professionals and AWW community workers. BPNI has 54 national trainers all over India and regularly conducts training of trainers in this field.

BPNI has taken the lead in training on the implementation and monitoring of the IMS Act, 2003. BPNI has produced the following documents for this purpose: a manual with tools for monitoring the compliance of the provisions of the IMS Act, "The law to protect and promote breastfeeding," and "Under attack," an Indian law to protect breastfeeding: a report on the monitoring of the IMS Act."

Indian Council of Medical Research

The ICMR oversees medical research in India. Apart from its regulatory function, ICMR directly steers research in high priority areas through its 26 research institutions scattered throughout the country, including: the National Institute of Nutrition, Hyderabad; the Virology Research Centre, Pune; the Malaria Research Centre, Delhi; the National Institute of Research in Reproductive Health, Mumbai; the National Institute of Cholera and Enteric Diseases, Kolkata; the National AIDS Research Institute, Pune; and the Tuberculosis Research Centre, Chennai.

Research in maternal and neonatal health is handled by the Division of Reproductive Health and Nutrition (RHN). ICMR has been supporting individual scientist's research on perinatal-neonatal subjects. Some of the studies funded by ICMR in the past include: the epidemiology of low birth weight, room air resuscitation, and infective etiology of prematurity and phenobarbitone in asphyxial injury.

In 2000, the ICMR organized a national workshop on research priorities on newborn health in which eminent researchers, neonatologists, and policymakers took part. The list of research priorities in operational, clinical, and basic science agreed upon at this workshop are shown in the box.

In accordance with the aforementioned recommendations, the ICMR has initiated a large community-based effectiveness study on the home-based care of newborns and young infants, with support from the Ministry of Health and Family Welfare and the Department of Women and Child Development. The study aims at replicating the SEARCH model of newborn care. This study, to be conducted at five sites, has three arms encompassing a population of about 60,000 each covered by two primary health centers. The home-based interventions will be delivered either by an AWW (intervention arm 1) or a new village-based worker, the Shishu Rakshak (intervention arm 2). The third arm comprises the comparison population. This study, funded wholly by the Government of India, is being conducted in rural areas near Patna, Lucknow, Udaipur, Wardha, and Cuttack.

The ICMR is also currently funding the NNPD initiated by the NNF.

Key Research Priorities in Neonatal Health in India*

I. Community-based and operational research

- Development and validation of a simple criteria for diagnosing neonates with sepsis
- Validation of the newborn component of the IMCI module
- Home-based management of neonates with sepsis
- Organisms causing neonatal sepsis in the community and their antimicrobial sensitivity
- Care-seeking behavior of families for their sick neonates and impediments to early care seeking
- Home-based management of LBW neonates
- Development of low cost primary newborn care technologies: mouth to mask resuscitation and KMC
- Studies on traditional beliefs and practices in newborn care in different communities
- Impact of antimicrobial interventions in bacterial vaginosis and urinary tract infection on the incidence of prematurity/LBW
- Impact of a combination of strategies to reduce the incidence of LBW (rest, less activity, FA, optimum nutrition, and no tobacco)
- Status of newborn care services at the secondary level

II. Hospital-based research

- Development of a fetal growth chart for classifying neonates as appropriate-for-dates, SFD, and large-for-dates
- Room air resuscitation of neonates and long-term neurodevelopmental outcome
- Risk factors and surveillance of antimicrobial resistance among organisms causing hospital-acquired neonatal sepsis
- Effect of early phenobarbitone therapy among neonates with birth asphyxia on neurodevelopmental outcome
- Effect of hypothermia among neonates with birth asphyxia on mortality and neurodevelopmental outcome
- Development and validation of a simple test for evaluating neurodevelopment status of at risk neonates
- Epidemiology and risk factors of transmission of HIV through breast milk
- KMC in the management of very LBW babies
- Effect of vitamin E therapy and other interventions on the incidence of retinopathy of prematurity
- Application of oil on skin as a method of energy supplementation
- Postnatal growth norms of LBW/preterm babies
- Interventions for bacterial vaginosis and urinary tract infections to reduce the incidence of prematurity

III. Basic science research

- Basic research on determinants of kernicterus
- Development of a low-cost indigenous surfactant
- Development of low-cost, simple diagnostic tests for genetic disorders
- Genetic/molecular epidemiology of pathogens of NNS

IV. Capacity building

- NNPD
- Training in research methodology

*Based on the recommendations of the National Workshop on Research Priorities in Newborn Health, January 2000

UNICEF

UNICEF, one of the world's leading agencies for children, has worked in close partnership with the Government of India at central, state, and local levels since 1949 in support of its policies and programs. With an estimated 400 million children aged 0-18, UNICEF's India country program is the largest in the world.

The overall goal of this cooperative Government-UNICEF program is the progressive fulfilment of the rights of all children and women, together with the creation of an enabling environment to ensure equity and strengthen accountability toward children. In this regard, UNICEF has applied its knowledge base, position to advocate, strong field presence, and ability to network and forge partnerships to support the Government of India and state governments with its own national children's agenda since 1949.

Following the articulation of the NHP of 1983 and goals for the reduction of maternal, perinatal, infant, and child mortality rates, UNICEF supported the UIP,, which included frequent contacts with women and children by way of the Growth and Development, Oral Rehydration, Breastfeeding, and Immunization (GOBI) initiative. As a result, significant decline in neonatal, infant, and child mortality rates were recorded during the period 1984 to 1992.

The CSSM Program (1992-92) and the RCH Program (1992-97) were supported by UNICEF in areas of technical and financial assistance, supplies and equipment, procurement services, transport, funds for advocacy, research and studies, consultancies, program development, monitoring and evaluation, training activities, and staff support. Part of UNICEF's support is also provided to NGOs as mutually agreed upon by the government and UNICEF within the framework of individual programs.

UNICEF collaborated with the NNF and AIIMS in newborn care training and operationalizing programs in Orissa, Madhya Pradesh, and West Bengal.

The SM component of UNICEF's programming embraces the three elements that are globally proven to be effective in addressing the immediate causes of maternal mortality: quality ANC, including prevention or treatment of existing conditions (anemia, tetanus, and malaria) that influence pregnancy outcomes; skilled birth attendance for maternal and newborn care; and EmOC, including birth preparedness and complications management. UNICEF is directing ongoing attention to educating and sensitizing women, their families, the community, and health workers in overcoming the three respective delays in accessing and offering care when an obstetric complication arises. In addition, UNICEF supports the national thrust to expand on the convergent model of maternal and newborn care, based on health and nutrition interventions. Ongoing operations research will continue to be an integral part of UNICEF's approach.

Ongoing studies on LBW babies and the relationship to birth preparedness and child resuscitation will be pursued further. Social audits on maternal and neonatal deaths at the community level will also be initiated. Efforts will be intensified to gather and refine pertinent data for evidence-based decision making by using the verbal autopsy method, indirect techniques of estimation of maternal mortality and morbidity, operations research, and impact evaluations involving communities and local institutions. These efforts will serve to enhance knowledge from data that are currently insufficient. In addition, they will be used to improve local capacity and encourage organizational change.

A program communication strategy, together with more proactive interventions to achieve community mobilization, organization, and participation, are also being expanded. To support the communications strategy and improve the quality of care and the capacity of skilled birth attendants, formal and informal partnerships will be further consolidated with professional associations, other UN agencies, and NGOs, community-based organizations, women's groups, and the PRIs.

UNICEF's role in the BDCS and the IMCI is covered in Chapter 7.

WHO

Maternal health

With respect to maternal mortality, the activities supported by WHO India during the biennium include:

Programmatic Interventions

- Providing technical and financial assistance for the launch of the first "National Safe Motherhood Day" on 11th April 2003.
- Developing "Life Saving Anaesthetic Skills for Emergency Obstetric Care." To overcome the shortage of anesthetists at FRUs, an 18-week training course has been developed, piloted, and the first course for MBBS doctors completed. It is expected that these skilled health care providers will be able to bridge the gap and provide specialized services for EmOC, thereby saving the lives of both mothers and newborns. The major training emphasis has been on developing the required skills and competencies.
- Expanding safe abortion services. WHO has supported the Government of India pilot initiative on introducing manual vacuum aspiration (MVA) at the PHC level through capacity building of medical doctors. The pilot phase includes the training of approximately 320 medical doctors in MVA.
- Technical assistance was provided during the process of amending the MTP Act that has now been further simplified. The act also includes provisions for medical methods of abortions.
- Developing community-level skilled birth attendants (CLSBAs). There is a need to bridge the gap between TBAs and ANMs to provide skilled attendance at birth and to provide ENC. WHO has extended support to a Government of India initiative in piloting a program of CLSBAs. The curriculum is based on skills and competencies and includes a trainer's guide, job aids, and training-of-masters' training. The CLSBAs are expected to be working as village-based entrepreneurs.

Research Activities

- Operational research on community and facility-based interventions for Making Pregnancy Safer by the National Institute of Health and Family Welfare.
- Investigating maternal deaths through instituting facility based reviews, community-based verbal autopsies, and confidential enquiries at three major hospitals.
- Feasibility of using Misoprostol at the peripheral level for prevention of postpartum hemorrhage by ICMR.
- A clinical and microbiological study in women by the National Institute of Research and Reproductive Health (NIRRH), Mumbai.
- Need for emergency contraception among potential users by the NIRRH, Mumbai.
- Assessing and building the capacity of the primary health care system for RTI/STI prevention and management.
- Promoting male involvement for improving reproductive health by the NIRRH, Mumbai.

Other Activities

These are multiple and include advocacy, promotion of partnerships, monitoring and documentation, technical advice and training.

Neonatal health

The Child and Adolescent Health and Development department of WHO strives for a world in which children and adolescents enjoy the highest possible level of health—a world that fulfils their needs and rights,

enabling them to live to their full potential. The department accords top priority to improving neonatal health and is committed to promoting the concept that "A healthy start in life is important to every newborn baby."

The major activities of the department are focused on interventions that reduce infant mortality and ensure that newborns and infants have the opportunity for a healthy start in life. WHO, in collaboration with BASICS II, organized a workshop on "Neonatal Care in Southeast Asian Region: A Situational Analysis" in New Delhi in April 2002 to identify gaps in providing optimum neonatal care.

Success in reducing neonatal mortality is very closely linked to the availability of ENC in peripheral health facilities. WHO recognizes the need for building the capacity of health workers and supplying equipment for ENC. WHO has supported the operationalization of ENC at the district level in 142 districts during the last four years.

The IMNCI strategy accords a high level of importance to neonatal health, which is reflected by the inclusion of the first seven days of life in the clinical guidelines, ENC home visits, and guidelines for referral and facility-based neonatal care.

WHO has been actively engaged in research activities to improve home and community practices that lead to gains in neonatal health and survival. WHO is also actively involved in Phase I and II of the National Health Research Initiative in India by INCLEN and other partner agencies. Efforts are also underway to develop tools to promote improved neonatal care within communities and at health facilities.

WHO supports advocacy efforts to orient policy and decision-makers and to highlight the newborn agenda in various forums. WHO supported a national seminar on neonatal health at the conclusion of Newborn Week in November 2000. During the last three years, WHO has participated in all technical and advocacy activities of the NNF and other activities aimed at improving neonatal health in the country.

The WHO Collaborating Centre for Training and Research in Newborn Care, located at AIIMS, New Delhi, is playing a leading role in the field of newborn health in the South East Asian Region.

Finally, WHO is making a significant contribution to integrating the IMNCI approach into the RCH II program.

UNFPA

UNFPA is the world's largest multilateral funding agency for population and development. UNFPA's first program of assistance to India began in 1974 with an allocation of US $46 million, primarily for improving FP services, establishing a population database, and promoting activities in the formal school sector. Since then UNFPA India has extended support to the Government of India's policies and programs on population and provided assistance in the following areas: infrastructure development, technology transfer, improvement in the quality of services, management information systems, training, and IEC. More emphasis has been placed recently on community involvement, women's development, the empowerment of weaker sections of society, and enhancing the role of nongovernmental organizations.

Since the ICPD, UNFPA has concentrated its funding in three core areas:

Reproductive health and FP
UNFPA supports quality reproductive health services on the basis of individual choice. Key elements include: meeting the need for family planning, ensuring maternal health and reducing infant mortality,

preventing and managing sexually transmitted diseases and reproductive tract infections, preventing HIV/AIDS, and eliminating traditional practices such as female genital mutilation that are harmful to women's reproductive health and well being.

In carrying out these activities, the Fund works with the WHO, the UNICEF, UNAIDS, the World Bank, the International Planned Parenthood Federation, the Population Council, Pathfinder International, PATH, and many other population and women's NGOs, particularly at the local level. UNFPA gives special attention to the reproductive health needs of adolescents and women in emergency situations.

One of the focus areas in UNFPA's Sixth Country Program in India is on EmOC covered in Chapter 7.

Population and development strategies

UNFPA supports the development of national population policies as an integral part of sustainable development strategies, according to the priorities of each government. UNFPA also finances data collection and analysis, interdisciplinary research to clarify population linkages, and research leading to the elaboration of indicators for monitoring the impact of programs. In its data collection activities, UNFPA ensures that all data are gender specific.

In extending support in these areas, the organization works with various partners including the UN and the regional commissions, the UNDP, the International Labor Organization, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Bank, and bilateral and intergovernmental organizations. UNFPA also maintains contact with academic groups and professional societies.

Advocacy

As a follow-up to the ICPD, UNFPA works with international organizations, governments, and nongovernmental organizations in all countries to convey a clear understanding of the messages of the conference, to maintain political and nongovernmental commitment and action, and to mobilize the financial resources needed to achieve ICPD goals and the ICPD+5 benchmarks.

DFID

The India assistance program of the UK government's DFID is its largest for any country; in fact, DFID has recently emerged as the leading bilateral donor in India. DFID supports programs on education, health, rural livelihood, infrastructure, urban development, and power sector reform, among others.

DFID's health program is driven by priorities and objectives aimed at attaining the MDGs. The comprehensive health sector strategy has a pro-poor orientation and thrust. The areas of support include RCH, HIV, polio eradication, and TB control. The states of West Bengal, Orissa, Andhra Pradesh, and Madhya Pradesh are the geographic focus for DFID's health system strengthening initiatives.

DFID recognizes the critical importance of improving neonatal health in order to achieve the child mortality MDG. At the global level, it is a key member of the HNP and is collaborating with WHO, SNL, and others to formulate a framework for developing newborn health strategies and programs at the country and subcountry levels. Recently, DFID conducted a study on the determinants of NMR and MMR among Indian states, with the aim of learning lessons for achieving optimum synergies between safe motherhood and newborn health strategies.

DFID will be the second major contributor (after the World Bank) to the external assistance component of the second phase of the RCH program (2004-09), currently being developed by the Government of India.

USAID

The United States government has been providing assistance in India for more than 50 years. Today USAID is investing in economic growth, health, disaster management, environment, and equity in India. Programs focus on areas where assistance is needed most and people-level impact is high. Cutting edge alliances between U.S. and Indian organizations quicken the pace of progress.

Within the broad area of health, USAID supports programs in child health, reproductive health, HIV/AIDS, and infectious diseases (primarily TB). Among child health activities, neonatal health is a high priority for support by USAID/India, as well as USAID/Washington. USAID supports a number of neonatal health-related activities in India, including the following:

- CARE-India: USAID/India supports the Integrated Nutrition and Health Project II, including an important component of community-based newborn care. USAID also supports the companion evaluation study, where the effect of this intervention on neonatal mortality is being evaluated and which is being implemented through King George Medical University (KGMU) and Johns Hopkins University (JHU).
- IndiaCLEN: USAID/India has supported the development of the Neonatal Health Research Initiative (NHRI) by IndiaCLEN and will support a number of upcoming research activities within this initiative.
- KGMU and JHU: In addition to the CARE community-based newborn care evaluation cited above, USAID/India supports KGMU and JHU in conducting an implementation study of the thermoprotection of newborns in a study area in Shivgarh, Uttar Pradesh. This study is co-funded by SNL.
- Urban Health: Through the Environmental Health Project, USAID supports pilot activities to improve newborn health in urban slums, as well as national and city health planning that includes attention to newborn health.
- Reproductive Health: Through the Innovations in Family Planning Services (IFPS) Project, USAID/India supports reproductive health interventions that directly improve neonatal survival, including delaying the age of first pregnancy, the increased use of family spacing methods and increased birth intervals, improved approaches to provide EmOC, and access to SBAs through the development of a cadre of community midwives.
- NFHS: USAID provides support for large-scale surveys such as NFHS to provide a comprehensive database for key child health and maternal health indicators, including neonatal mortality, infant mortality, child mortality, immunization coverage, nutritional status of children, care during pregnancy and child birth, contraceptive use, birth intervals, and source of services.
- WHO: The workshop on "Neonatal Care in the Southeast Asian Region: A Situational Analysis" and subsequent related activities have in part been supported by USAID/Washington.

Saving Newborn Lives, Save the Children/US

Save the Children/US is a pre-eminent provider of development and humanitarian assistance in 45 countries around the globe. The organization aims at creating lasting, positive change in the lives of children in need. A constituent of the 26 member International Save the Children Alliance, Save the Children works with communities, local NGOs, government ministries, and other international voluntary organizations through a combination of approaches including community mobilization, institutional development, partnership, and advocacy. The organization specializes in areas including health, education, economic opportunities, food security, and emergencies.

SNL is a 15-year initiative of Save the Children/US, with the goal of improving neonatal survival and health in developing countries. Established in 2000 with a generous grant from the Bill and Melinda Gates Foundation, SNL aims at increased and sustained use of healthful practices and key services for improving newborn health.

SNL works in 12 countries in Asia, Africa, and South America that have a particularly high burden of newborn deaths. SNL aims at forging strong alliances with national governments, professional bodies, nonprofit organizations, and multilateral and bilateral agencies. SNL's country programs are based on local needs and priorities and developed and implemented in partnership with national stakeholders.

SNL's strategic approach and some representative activities follow:

- Strengthen and expand proven, cost-effective services. SNL works to improve policies and expand programs to reduce neonatal mortality in developing countries. Some examples of activities in this regard include: programs on TT immunization of women of child-bearing age in Mali, Pakistan, and Ethiopia; and large scale community-based programs on ENC in Pakistan, Bangladesh, Nepal, Mali, Malawi, and Bolivia.
- Adapt and refine promising model programs. SNL supports the adaptation and expansion of successful model programs that improve the quality of newborn care practices by mothers and family members. For instance, SNL is supporting KMC programs in Malawi, Vietnam, and Bangladesh.
- Advance the state-of-the-art related to newborn care. SNL is collaborating with local researchers, organizations, and institutions to test effective approaches and introduce new, low cost technologies that will impact newborn survival. SNL supports over 30 research projects worldwide. Key areas of research include: IMNCI, positive deviance approach to improve newborn health, testing Uniject™ for antibiotic administration in neonates, improving understanding of cultural factors affecting community and household practices, and evaluating community-based approaches to prevent and manage birth asphyxia, sepsis, and hypothermia. In addition, SNL is developing new tools and methodologies to understand the causes of neonatal death, improve mortality reporting, and identify and manage sick neonates.
- Mobilize commitment and resources. SNL is working to educate governments, NGOs, and donors about the nature and magnitude of the problem of neonatal mortality and what can be done to address it. SNL published and disseminated the first-ever *State of the World's Newborns* report in 2001 and organized events at the UN General Assembly Special Session on Children in 2002. SNL is contributing to partnering the formulation of neonatal health strategies in several focus countries.
- Establish strategic partnerships. SNL is working in collaboration with a wide range of institutions in developed and developing countries, including universities, NGOs, ministries of health, and development assistance agencies. These partnerships enable SNL to promote action research, disseminate program learning, and take good ideas to scale to improve neonatal health and survival. SNL is the secretariat of the HNP, an interagency group of over 30 organizations, and a member of the new international Partnership for Safe Motherhood and Newborn Health.

Some of the resource materials prepared by SNL are: situational analysis reports on newborn health in Bangladesh, Pakistan, Nepal, Bolivia, Mali, and Malawi; global reviews on interventions for newborn health and on birth asphyxia; a qualitative research guide; policy briefs on neonatal health ("Healthy Mothers Healthy Babies," "Why Invest in Newborn Health," "Evidence to Save Newborn Lives," "The Healthy Newborn Partnership: Improving Newborn Health and Survival and Health Through Partnership, Policy, and Action"), a compendium "Shaping Policy for Maternal and Newborn Health," training materials for providers, and monitoring and evaluation tools.

India program

SNL is supporting a host of programs on neonatal health in India.

Operations Research

SNL is supporting the Ankur project of the SEARCH, Gadchiroli, with the aim replicating SEARCH's much-acclaimed model of home-based newborn care in seven rural, tribal, and urban communities in Maharashtra serviced by NGOs. SNL is also assisting SEARCH in refining and disseminating HBNC training materials. Other research studies supported by SNL include: hypothermia prevention and management trial (Lucknow), an evaluation of a CARE India project on newborn health (Lucknow), and the Uniject™ gentamicin neonatal dose standardization study (Vellore).

Kangaroo Mother Care

SNL sponsored a workshop on KMC in Delhi in 2002 in which the leading neonatologists outlined a roadmap for promoting KMC in the country. Accordingly, five physician-nurse teams were trained in KMC at Bogota, Columbia. In the next phase, SNL is now supporting PGIMER Chandigarh and KEM Mumbai in developing their KMC demonstration sites, and AIIMS New Delhi in refining training materials and launching an India-KMC website. The three institutions along with KGMU, Lucknow and IOG, Chennai have formed the KMC India Network. This Network will provide in-service, on-site, and continuing training and education in KMC to physicians, nurses, and others, and assist interested centers in operationalizing this promising modality of newborn care.

Nurse Training and Education

SNL is supporting a project on capacity building for newborn nursing at district and subdistrict levels. A training module developed at AIIMS is being disseminated. Trainers' workshops will be followed by workshops in the districts.

Partnerships

SNL is working with professional bodies, bilateral, and multilateral organizations and institutions to promote maternal and newborn health in India. SNL is partnering with the NNF for advocacy, education, and action, and assisting the Government of India in the RCH II design process.

The White Ribbon Alliance for Safe Motherhood in India (WRAI)

WRAI was launched in November 1999 by a few organizations interested in working for Safe Motherhood. WRAI represents more than 63 organizations, including NGOs, donor agencies, bilaterals, multilaterals, and many committed individuals working as a coalition to increase awareness, build alliances, and act as a catalyst for action to reduce maternal mortality. WRAI has five state-level alliances.

A few significant accomplishments of WRAI follow:

- The 2001 March to the Taj Mahal drew national and international media coverage and elevated the issue of SM to one of the most visible priorities of the nation.
- WRAI won the Global Safe Motherhood Award of the Global Health Council in 2000 and 2003.
- On the appeal of the WRAI and active lobbying, the Government of India has declared 11th April as the National Safe Motherhood Day.
- WRAI planned and hosted the first international White Ribbon Alliance Conference — Saving Mother's Lives: What Works—in October 2002 in New Delhi.

- WRAI has been promoting the use of SBAs and has been working with the Ministry of Health and Family Welfare in the development of a cadre of skilled birth attendant.
- A SM best practices field guide (*Saving Mother's Lives: What Works*) was published and released during the international conference in October 2002. This field guide has evidence-based practices and how-to guidelines for safe motherhood.
- To mark the first celebration of the National Safe Motherhood Day, the WRAI, held a rally "Save Our Mothers" at India Gate on April 10, 2003.
- On April 11, 2003, in collaboration with the WRAI, the Ministry of Health and Family Welfare organized a launch function to declare the first National Safe Motherhood Day and for launching the Janani Suraksha Yojana by the Minister for Health and Family Welfare.

CARE-India

CARE India is a pre-eminent NGO working in the area of nutrition and maternal and child health.

The Integrated Nutrition and Health Project - II (INHP II) is the second phase of a ten-year project (1996-2006) being implemented by CARE India with the goal of achieving "sustainable improvement in the nutrition and health status of women and children," and with the specific impact objectives of reducing infant mortality and child malnutrition in project areas, which include 70 districts in the states of Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, and West Bengal, constituting a population of about 100 million. The project is implemented in partnership with the ICDS and health departments, NGOs, and community-based organizations, and with the support of USAID.

The main areas of intervention supported by INHP II include community-based newborn care, primary (routine) immunization, and promotion of maternal and child nutrition. The approach is to put in place a number of processes that should enhance the effectiveness of the ICDS and health systems in these intervention areas. This includes, among others, focused efforts to achieve complete coverage with simple interventions known to be effective, a life-cycle approach to ensure continuity of care through the vulnerable phases of pregnancy and early childhood, the recruitment of community volunteers as change agents, and the use of community actions to catalyze critical behavior change.

Strengthening home-based newborn care is INHP II's primary strategy for reducing neonatal, and thus, infant mortality. The approach is utilizing mainly the AWWs and changing agents to maintain close contact with the pregnant woman and the newborn child to implement a package of interventions consisting of ANC, ENC, special care of the weak newborn, and recognition and referral of sick neonates.

A concurrent study supported by SNL is evaluating the effectiveness of this package implemented at scale in one district in Uttar Pradesh.

IndiaCLEN

With the assistance of USAID, the INCLEN was formed in the late eighties in developing countries of Asia, Africa and Latin America. Six medical schools formed the network in India. The faculty members, drawn from departments of medicine, pediatrics, community medicine, biostatistics, and obstetric/gynecology were trained in clinical epidemiology, health economics, biostatistics, and social science research in North America and Australia. These resource persons and their respective institutions have now formed IndiaCLEN as an Indian entity affiliated to the INCLEN.

IndiaCLEN institutions have conducted research on areas including invasive childhood infections, ARI management, program evaluation (pulse polio program, injection safety, family health program, HIV infection, and family violence.

In 2002 IndiaCLEN launched the NHRI with USAID funding. In the initial phase, three formative research studies were initiated at nine sites in the following areas of newborn health: family practices and care seeking, causes of neonatal deaths, and facility survey to asses newborn care services. These studies are currently nearing completion.

IndiaCLEN is presently in the process of launching intervention studies.

PATH

PATH is an international NGO dedicated to developing, implementing, and evaluating innovative solutions to public health problems. The mission is to improve health, especially the health of women and children. PATH shares knowledge, skills, and technologies with governments and nongovernmental partners in low-resource settings around the world. PATH does not provide direct clinical services.

Since 1977 PATH has managed more than 1,000 projects in 120 countries, directly benefiting people, communities, and countries with limited health resources. In India, PATH has offices in New Delhi and Hyderabad.

In India, PATH's many projects include:

- Program for Advancement of Commercial Technology: Child and Reproductive Health (PACT-CRH). To improve the quality of RCH services, PACT-CRH promotes the commercialization of viable health technologies. Through this five-year, $20-million project, PATH works with the private sector to facilitate technology transfer and provide the technical assistance needed to bring new public health products, such as diagnostics and safe injection products, to the market.
- Children's Vaccine Program (CVP). In partnership with national and state government, CVP strengthens routine immunization services and introduces new vaccines (such as hepatitis B) into the country's Universal Immunization Program. PATH provides assistance with technical issues, training, and monitoring and evaluation. This project has been implemented extensively in Andhra Pradesh and is being scaled up in other parts of the country.
- India Injection Safety Coalition. This national network promotes safe and appropriate injection practices in India. PATH is the founding member of the coalition and serves as the secretariat.
- Ultra Rice™. PATH is working to enhance nutritional content through rice formulations fortified with vitamin A and iron. PATH is currently assessing the commercial and public health application of these fortified-rice products in India, where iron deficiency is widespread.
- Prevention Options for Women. PATH is advocating for the development of microbicides, woman-initiated prevention options that may some day prevent HIV/AIDS, and working to identify the most effective ways to introduce the female condom and SILCS diaphragm into India.

PATH forms strategic alliances and partnerships with NGOs, the private sector, ministries of health, governments, and international agencies. Through these alliances, it helps leverage public and private resources, increase human and financial capital, and maximize opportunities to influence public policy and scale up effective programs.

Population Council

The Population Council is an international NGO with headquartered in New York. Established in 1952, it aims to improve the well being and reproductive health of current and future generations around the world. Considered one of the world leaders in the area of population research, its key activities in India are related to conducting operations research studies to improve the quality and outreach of services related to family planning, HIV/AIDS, and reproductive health in general; conducting exploratory research on reproductive health and behavior; and strengthening professional resources in country through collaborative research with institutions working in the area of research or services implementation.

The Population Council's research in India does not presently address neonatal health directly, but much of its work on sexual and reproductive health has direct links with survival of the child. In India, it works closely with partners to improve the lives of couples through exploring and demonstrating means of improving their reproductive health, with the intermediate aim of improving the access and quality of family planning and maternity services and supporting measures that reduce maternal and newborn mortality in a broad-based gender-sensitive approach. Examples of studies underway in India that are related to newborn health include a review of the health of women and newborns in the country, work with young couples during pregnancy and childbirth into the late postpartum period, male participation in maternity care, and young adolescent girls' interventions to improve their livelihood skills. The main focus of these studies has been on young couples, first-time parents, actively involving men, and testing a community-based approach to improve maternity care. Other projects in the past have contributed towards neonatal health by exploring other areas and suggesting interventions. These have included: the determinants of maternal mortality; reducing unplanned pregnancy through better access and quality of reproductive health services, including maternal and newborn care, and managing the consequences of unsafe abortion; preventing the spread of HIV/AIDS; HIV/AIDS care and support; increasing adolescent girls' knowledge and mobility to access reproductive health services; promoting best practices in breastfeeding; and preventing gender-based violence.

Experts at the Population Council in India are exploring and actively participating in policy formulation and operations research, along with partners such as the USAID, WHO, UNFPA, PFI, FRSH, IIPS, ESIC, PSS, and many others over the years.

CEDPA

CEDPA India has been working with NGO partners in India since 1988 with the mission of empowering women at all levels of society to participate as full partners in development. CEDPA has been the leading cooperating agency in the USAID-funded IFPS Project since 1994. In India, CEDPA is known for its broad experience in community-based RCH programming, linked with women's empowerment initiatives. CEDPA has well-recognized expertise in reproductive health, training, leadership, advocacy, gender, adolescent health, and social mobilization and participation.

CEDPA/India is the founder and secretariat of WRAI.

CEDPA has extensive experience in India implementing adolescent, child spacing, FP, maternal health, reproductive health, and child health programs with funding from USAID core funds, mission field support, and private funding sources. Over the past fourteen years, CEDPA has gained significant expertise in the above-mentioned technical health areas, in developing systems to scale up successful community-based service delivery models, in building the capacity of local organizations in sustainable, quality, community-based health service delivery, and in developing and strengthening networks that promote and foster behavior

change. CEDPA gets results by increasing physical access to services through a community-based distribution approach and by enabling women and families to make and act on positive health seeking and behavioral decisions. In India, CEDPA efforts have reached of over 22 million people through its services in their communities.

As a follow-up of a USAID-funded child survival project carried out by PLAN International through Child Aid and Sponsorship Program (CASP), CEDPA was requested by the USAID Mission to implement a project that would ensure that the benefits gained in the child survival project would not be lost after the project. CEDPA partnered with CASP on a two-year project, "Sustainability of Community-based Reproductive and Child Health Services" (2000-02). CEDPA would like to expand the successful service delivery models for maternal and child health and birth spacing to additional states.

9 Gaps and The Way Forward

With nearly 26 million births and 1.2 million neonatal deaths each year, India's newborn health agenda is unparalleled. The present NMR of 44 per 1,000 live births[1] is unacceptably high. Apart from less than 20 countries, mostly in sub-Saharan Africa, the whole world has achieved a lower NMR than India, including countries such as Syria, Brazil, Sri Lanka, Indonesia, China, Kenya, Zimbabwe, and Iran (whose NMRs are as low as 18, 19, 20, 22, 23, 28, 29 and 30, respectively).[2]

Indeed, the present state of India's newborns is not consistent with her eminent standing in the world. A country with stellar achievements in the political, economic and social realms can and must improve newborn survival and health in the near future.

A vast majority of neonatal deaths can be averted through affordable interventions. A recent analysis for the Child Survival series in *The Lancet* shows that if the known interventions (such as breastfeeding, clean delivery, resuscitation, temperature management, antibiotics for sepsis) were universalized, 54 percent of deaths due to neonatal conditions in India could be prevented.[3] Many more newborn lives can be saved by birth spacing and maternal health interventions. The challenge is how to translate knowledge into action. An examination of the constraints to a lower NMR and outline an approach to accelerate newborn survival in the country follows.

Policy and Program

Policy

The overarching policy framework governing reproductive, maternal, and newborn and child health in India is the NPP (2000).[1] The Tenth Five year Plan documents have enlarged upon the NPP objectives and laid down strategic directions.[2]

The table below shows key policy commitments of the Government of India that are directly or indirectly linked to newborn health and survival.

Table 9.1 Policy commitments of the Government of India

Policy	Goals/ Objectives
1. NPP[4]	• Reduce IMR to less than 30 per 1,000 live births by 2010 • Reduce MMR to less than 100 per 100,000 live births by 2010 • Achieve 80% institutional deliveries and 100% deliveries by trained personnel by 2010
2. Tenth Five-Year Plan[5]	• Reduce NMR to 26 per 1,000 live births by 2007* • Reduce IMR to 45 per 1,000 live births by 2007* • Reduce MMR to 200 per 100,000 live births by 2007

* State-specific targets laid down

Recently, national policymakers have unambiguously recognized the importance of neonatal health. Improving newborn survival is seen as the critical step towards further reduction in infant and child mortality and, in turn, for population stabilization. The NPP document explicitly states, "Our priority is to intensify neonatal care."[4] The Tenth Plan documents provide a detailed analysis of the situation, highlight the relevance of neonatal heath, and lay down clear strategic directions for achieving a reduction in newborn mortality.[5] State-level goals for NMR in 2007 have been stated, and specific budget allocations have been made for home-based newborn care, neonatal equipment, TBA training, and the operationalizion of EmOC and neonatal care.

India is committed to achieving the MDGs, although the country has not yet formally announced specific goals and indicators in that context. However, reducing child mortality by two-thirds of the level in 1990 by 2015 would mean achieving an under-five child mortality rate of 36 per 1,000 live births. Since neonatal deaths account for almost half of child deaths, this would require reducing the NMR to 50 percent of the current level.

India's RCH program integrates FP and maternal, neonatal, child, and adolescent health components. It ensures a complete synergy between SM and CS strategies at the conceptual, strategic, and operational levels to the advantage of total neonatal health and survival.

RCH program, now moving into phase II (2005-10), is the pathway to translate policy into action and goals into accomplishments. India clearly has an abiding policy commitment to newborn health.

Program

Prior to the 1990s, newborn health was not seen as a separate component of the child health program. The focus, rather, was on immunization and control of diarrheal disease. However, the 1980s were the years when NNT deaths plummeted in the country, thanks to widespread maternal TT immunization. As a result, the NMR declined from 67 (per 1,000 live births) in 1982 to 50 by the year 1992—an unprecedented one-quarter decrease in just a decade.[6]

It was at this stage (1992) that the CSSM program was launched, and ENC was, for the first time, included as a component of the CS package. These ENC interventions include: care at birth, including resuscitation, prevention of hypothermia, exclusive breastfeeding, prevention of sepsis, and referral of sick neonates. The implementation of the ENC package was undertaken by the government in selected districts at district hospitals, in the newly created first FRUs, and in PHCs. The program employed two strategies: the training of facility-based providers and the provision of neonatal care equipment. In addition, the training of TBAs was continued.

A total of 26 districts were covered with the help of the NNF.

In 1997 the CSSM program was replaced by the RCH program; ENC continued to be a part of the intervention package and the overall strategy of facility strengthening and skill upgrade continued. The newborn care training became more comprehensive, and a total of 80 districts were covered — yet again, with the exemplary support of the faculty of the NNF. TBA training also continued in the RCH program after a brief interlude.

The CSSM and RCH programs have given high visibility to newborn health in the country. The importance of newborn care has become obvious to providers, administrators, professionals, academics, and program managers from the top down to the subdistrict level. The program also succeeded in upgrading the skills of many serving physicians in newborn care. The sustained implementation and use of newborn care at government facilities, however, is still lacking.

The ENC interventions in the CSSM and RCH programs were primarily focused on facilities and not on the community, where most births and newborn deaths take place. This is the *most critical programmatic gap* that must be addressed effectively.

The strategies and action plans for the next five-year phase (2005-10) of the RCH program are under development at the time of this writing, and the guiding principles have been outlined elsewhere in the report. The draft RCH II implementation plans provide a blueprint for interventions drawn from and built on SM and CS strategies. ANC, institutional deliveries, and EmOC will be strengthened. The neonatal health strategy in the RCH II program has a clear community focus. It has been proposed to introduce home-based newborn care in large parts of the country using the IMNCI strategy.[7] Through home visits, grassroots providers—namely AWWs, TBAs, link volunteers, and ANMs—would deliver ENC by improving family practices. LBW neonates will get extra visits, attention, and care. In addition, facility-based care would be scaled up..

In line with the differential strategy to maternal health recommended by the Planning Commission,[5] RCH II proposes a scenario-based approach for prioritizing newborn health interventions in different states. This implies that the individual states could introduce a mix of interventions based on the status of newborn health, the state of existing services, and the capacity of the health system. All states will promote family-oriented services (such as BCC to promote breastfeeding) and strengthen existing population-oriented outreach services (such as maternal TT immunization and ANC checkups). Those states with stronger systems will focus on a more comprehensive home-based newborn care approach through postnatal contacts. States with lower NMRs and better facilities will add individual-oriented clinical care at facilities from the district level down. A newly developed tool (Marginal Budgeting for Bottlenecks) promoted by UNICEF and the World Bank will be used to prioritize and monitor the program at the state and district levels.[8] Within the broad national guidelines, the States will develop and implement state level plans for RCH II.

Thus, the next phase of the RCH program encompasses a comprehensive newborn health approach. The goals are ambitious and the strategies are unprecedented in scope and depth. The RCH II program could very well be a turning point in neonatal health and survival.

Key program issues

Political and Administrative Commitment

Even though the RCH II strategy is addressing key issues in newborn health, there are formidable challenges. India has a federal system and health is a state subject. State administrations and institutions must recognize neonatal health as a priority. Strong polices, elaborate plans, and comprehensive program documents will not, by themselves, change the reality on the ground, unless the state machinery is also galvanized. Nearly half of newborn deaths in the country take place in the states of Uttar Pradesh, Bihar, and Madhya Pradesh.

These are the states where the health system is very weak. The performance of these states in nonhealth sector programs is also unsatisfactory. The challenge is how to improve newborn survival even in the face of these systemic inadequacies which plague not only these states but most others to varying degrees. Perhaps the key is the political and administrative commitment. Ways have to be found to elicit ownership of the program by the political, administrative, and technical leadership of the states. This would require a concerted effort by the national government, developmental partners, the NNF, academia, and champions from the civil society. Importantly, to make progress in this regard, advocacy efforts must also be stepped up, at the state level.

Equity in Neonatal Health—Reaching the Unreached

Neonatal ill health and mortality are several times higher among the poor, both rural and urban. It has been argued that the global MDGs on child health could be attained without improving outcomes among the poor.[9] It might, therefore, be possible that the desired decline of the NMR in India in the next decade is possible without a significant change in neonatal survival among the poor communities. But that would be a pyrrhic victory at best. In a democratic country like India, whose Constitution promises equality to all her citizens, it is essential that all health benefits, especially maternal and newborn health gains, accrue to the poorest, the weakest, and the marginalized segments of the society. This necessitates flexible approaches to reach neonates in tribal areas, peri-urban slums, outer fringes of the villages, and the far-flung mountainous and desert regions. Program monitoring systems should include equity-specific process indicators to make sure that implementers do not lose sight of this critical dimension.

Neonatal Tetanus

Despite remarkable successes in reducing NNT, WHO estimates show that India tops the list of nations burdened by this disease, with 48,600 neonatal deaths annually due to this preventable disease.[10] NNT almost always affects infants of the poorest communities. A declaration at the UN General Assembly Special Session (2002) calls for the global elimination of NNT by the year 2005.[11] The multi-year plan of the Universal Immunization Program aims at elimination of NNT from the country by 2009. It is the duty of all stakeholders and champions of newborn health in the country to lend support to this initiative. Pockets of NNT need to be located and reached.

Treating Neonatal Illnesses in the Community

A critical gap hampering delivery of newborn care at the grassroots level is the lack of a competent provider at the village level capable of treating newborn illnesses. The ANM covers a set of 4-6 villages and may be far away from the hamlet in which a baby develops pneumonia in the middle of the night. TBAs cannot manage serious neonatal conditions; at best they may be expected to identify danger signs and facilitate care seeking. The facilities with adequate services may be miles away. Families find it extremely difficult to seek and receive care because of ignorance, lack of resources, transportation difficulties, etc. A study by SEARCH showed that only 2.6 percent of neonates suffering from major illnesses were treated by doctors.[12] During the intervention phase, a village health worker trained in the care of neonates and capable of administering an intramuscular injection of gentamicin could treat most of the sick neonates effectively and bring down newborn mortality by 62 percent.[13] However, the existing system in the country does not have such a village-level health worker. One option is to involve village practitioners (registered medical practitioners) who treat adults and children alike and often administer injections, but their competence is suspect. They reside close to where the babies are, however, and are generally accepted by communities. It is desirable to explore through operations research whether such practitioners can be trained and relied upon to provide care to sick neonates in the community— assuming the state would permit them to do so legally if such an approach would save newborn lives.

The issue of official sanction to give injections, ironically, applies even to the ANMs. Although ANMs administer intramuscular vaccines, they are not explicitly permitted to give antibiotic injections. There is an

urgent need to amend the rules to empower ANMs to administer injections to treat systemic infections in neonates and young children.

Anganwari Workers as Newborn Care Providers

AWWs, belonging to the ICDS system, are located in vast proportion of the rural and peri-urban communities. However, they do not belong to the health department and their main mandate is nutrition and child development. There is tremendous potential of involving AWWs in imparting newborn care at the home and community levels. Even though AWWs may not be able to provide care at birth, they can be involved in postnatal visits to mothers and newborns, and they can promote many elements of ENC, including weighing, exclusive breastfeeding, prevention and management of hypothermia, cord care, care of LBW babies, and detection of danger signs. At any given time, one AWW would have only 3-4 neonates in her area, including perhaps one LBW baby. It should be possible for an AWW to make home visits to see all of them and counsel families on newborn care, without a significant increase in their work load. Weighing and breastfeeding promotion, in any case, are part of the existing job description of the AWWs.

Unfortunately, because of administrative reasons, AWWs have not been incorporated more effectively into the care of neonates and infants. This anomaly must be corrected. AWWs are a precious human resource at the grassroots level and should be harnessed for saving newborn lives. Ensuring synergy between health department and ICDS may be the most important breakthrough for better neonatal health and survival within the existing system. Achieving this convergence requires a policy decision at the highest level because the two departments are administratively separate at the center and the state level.

In the next phase of the RCH program, a new provider, the RCH-link volunteer, is proposed to piloted in selected parts of the country. This worker would be modeled on the pattern of the VHWs in the SEARCH project[10] and in some other programs (Mitanin in Chattisgarh, the Jan Swasthya Worker in MP). She would impart home-based newborn care as well as tasks pertaining to FP, maternal health, and child health. The feasibility, utility, and sustainability of these new workers remain to be seen.

Skilled Birth Attendants

Perhaps the most critical gap in meeting the challenge of maternal-neonatal health is the low level of deliveries by skilled attendants. According to WHO, an SBA is a person with midwifery skills (for example, midwives, doctors, and nurses) who has been trained to proficiency in the skills necessary to manage normal deliveries and diagnose, manage, and refer mothers with obstetric complications.[14] Thus, a typical TBA even when trained is *not* an SBA.

Neonatal complications of birth asphyxia and prematurity require skilled management during labor and at and soon after birth. These cannot be addressed effectively in the absence of skilled birth attendants.

ANMs were expected to serve as community midwives but got assigned instead to collateral activities and responsibilities. Thus, most ANMs, even though they are called "midwives," do not conduct deliveries. In order to amend this anomalous situation, the pre-service midwifery training of ANMs should be strengthened, and opportunities to provide in-service training should be created, along with measures to encourage ANMs to conduct deliveries.

Countries such as Indonesia and Malaysia have succeeded in training and deploying a large number of community midwives over a relatively short span of time and have improved their maternal and neonatal outcomes.[15,16] The need for a village-level midwife is therefore urgent and well-justified.[17] Recently, the government has recognized this gap and launched a pilot project to train community SBAs who would practice in rural areas.

Traditional Birth Attendants

In rural India, almost 40 percent of all deliveries are conducted by TBAs.[18] TBAs are an integral part of the society and culture of traditional India. While it is true that TBAs have not contributed significantly to preventing maternal deaths, a reasonable body of evidence and experience suggests that they can contribute to improved neonatal outcomes.[19] Those working in the community recognize that the TBA is an important gatekeeper of newborn infants in village homes.[13] In India, there is a general consensus to continue to engage TBAs in the program for the time being. The challenge lies in strengthening their skills and providing them support from the health system. There is a need to review the training modules of TBAs and reorient them by including counseling and other skills in as many elements of ENC as possible. In this regard, significant inputs can be derived from the training modules developed in India (SWACH, SEARCH) and in the SNL-sponsored projects in Nepal and Bangladesh. Not all TBAs have the same level of education, awareness, or experience, and it is therefore suggested that more complex skills such as resuscitation may be imparted selectively to only those who have the ability to master them and who can sustain their skills by conducting a reasonable number of deliveries each month.

Institutional Deliveries

Achieving high rates of institutional deliveries is one of the goals of the NPP[1]. However, only 33.6 percent of all deliveries in the country occur in institutions at present. The NFHS noted that the recent increase in institutional deliveries is essentially due to an increase in deliveries in private sector facilities.[18] Thus, while this welcome trend should continue, it is essential that government facilities also contribute towards the NPP goal because most of the poor families cannot afford private care.

The next phase of the RCH program plans to make 50 percent of PHCs and all CHCs, and FRUs operational 24-hours for deliveries. This is a long overdue, albeit ambitious target that would require a well-orchestrated effort at facility strengthening, staff placement, logistic management, monitoring, and administrative support. The lessons learned from the success stories of Andhra Pradesh and Tamil Nadu in operationalizing 24-hour delivery services at PHCs need to be emulated and scaled up in all states. The backbone of these services would be the nurses providing round-the-clock skilled attendance. The RCH program provides funds for contractual nursing staff to meet this need. India has over 600 nursing schools and possibly a surplus of trained nurses, and it should be possible to meet the additional nursing manpower needs in RCH II.

If effectively implemented, the proposed Janani Suraksha Yojna, with a provision for compensating below-poverty-line mothers and the TBA upon delivery in a government facility, would improve institutional delivery rates among the poor.

Facility-based Care of Neonates in the Government Sector

In India, the existing SBAs, namely physicians and nurses, are located primarily in facilities, both government and private. The national policies aim at promoting institutional deliveries, but the state of the facilities for obstetric and neonatal care in the government sector is far from satisfactory. Most PHCs do not provide basic obstetric care, rarely conduct deliveries, and have no infrastructure for treating sick neonates; most FRU's are not operational.[20,21] That leaves the distant district hospitals to provide basic and EmOC and care for sick neonates of poor families who cannot afford care in the private sector. Not surprisingly, the SEARCH study found that only 0.4 percent of neonates with an indication for hospitalization were actually admitted.[12]

The public health system has many obstacles to overcome in providing reasonable quality and widespread obstetric and newborn care.

The initiatives to operationalize newborn care in facilities during the CSSM and RCH I programs with the help of NNF are a good beginning. However, it is important that initial training and equipping is matched by

concomitant organizational support, supervision, monitoring, and accountability to ensure sustained services to clients. Norms and standards of newborn care services at different levels of the facilities need to be developed, applied, and monitored.

The facility surveys under the RCH program examine only the infrastructure, staff, and facilities at district hospitals, FRUs, CHCs, and PHCs.[21] In future surveys, data generated on the neonatal care component should also be included to identify specific gaps at these institutions. Studies are needed to assess the functional status and quality of facilities in providing care to inborn and outborn sick neonates. Models of effective care at small facilities need to be devised, evaluated, and disseminated. It is possible at PHCs and CHCs to provide neonatal care largely through nurses, ANMs, and LHVs, with minimal dependence on physicians. The experience gained in operationalizing EmOC at facilities in the UNICEF-UNFPA project on AMDD would provide useful lessons for operationalizing neonatal care. Likewise, an evaluation of the district newborn care initiative of the NNF will provide useful insights for future initiatives.

It is ironic that a newborn infant, who is the most vulnerable patient, is not counted as a "bed" in facilities, small or big, but is considered an appendage of the mother. As a result, routine hospital resources including space, supplies and staff (especially nurses) are not allocated in the name of neonates. This anomaly that deprives newborn infants from being legitimately included into the health system must be rectified as soon as possible.[22]

Panchayati Raj Institutions

One important facet of India's democratic structure is the presence of a vibrant system of grassroots democracy and governance through the PRIs. People choose their representatives for three tiers of PRIs: the village, block, and district levels. PRIs are potentially unique partners for promoting maternal, newborn, and child health in the community.[22] One third of all seats in these institutions are reserved for women, who are likely to be more sensitive to these priorities. Some states like UP have health subcommittees in all PRI institutions. Several state governments are devolving the power of supervising ANMs and AWWs to the PRIs. This measure is likely to enhance the accountability of these workers to the public, notwithstanding the concerns about political interference. The PRI system provides an enormous opportunity for community participation in health programs. The challenge is to develop sustainable approaches for PRI partnership in different states. PRIs can be important catalysts for promoting skilled attendance, referral transport, and EmOC and newborn care. PRIs could be effective champions of healthy family practices for mothers, neonates, and children. They can be critical movers for swinging public opinion away from harmful newborn care traditions, beliefs, and practices. The government departments, local NGOs, and the NNF should engage PRIs for the cause of the newborn in each district, block, and village.[22] The NNF should prepare generic advocacy and education materials targeted to PRIs that could be translated into local languages and disseminated widely.

Community Newborn Care Models

Perhaps the most significant limitation faced by program planners as they draw plans to scale up newborn health strategies is the lack of large-scale newborn care models at the community level that could be scaled up and sustained. True, the country has pioneered primary care approaches to newborn care [13,23-26] But these studies have been limited in scope, covering a relatively small population. We have not seen a project that covered even a full district, for instance. Furthermore, some of the intervention packages[13, 23] required a new type of provider who is nonexistent in the present system. The available body of research provides precious information on what works at the community level, how to deliver ENC interventions in the community, and the degree of impact that could be expected on neonatal health outcomes. But application of these approaches on a program-wide scale would require additional effectiveness studies and pilot experiences.

In this context, ICMR's five-site, three-arm study assessing the impact of a home-based newborn care package on neonatal mortality is of immense importance. This study would help bridge the gap between

project and program paradigms of home based newborn care. Likewise, the Ankur project of SEARCH, the CARE projects, and the IndiaCLEN intervention studies would provide useful information for the program. It is hoped that by 2005-06, considerable experience would be available from all these studies. It is also expected that in the initial phase of RCH II, pilot implementation of IMNCI approach would be undertaken before scaling it up. This is a crucial step in order to evaluate and refine program tools and systems, to explore cost and sustainability, and to assess the likely impact on process and outcome indicators before the country embarks on a full-scale implementation of neonatal health interventions.

Complementing the Program

Addressing gender bias against the female neonate

India is witnessing a crisis in gender inequity. The preference for a male child by parents, coupled with a brazen collusion of the medial profession, has resulted in an alarming sex ratio at birth that is heavily tilted in favor of males. Only 933 female babies are born for every 1,000 males delivered. The present report has put together another piece in this unsavory saga of gender discrimination; studies show that among sick neonates admitted in the hospitals, there was only one female for every two males. It is evident that many communities avoid seeking care for female neonates.

Addressing gender bias against the girl child calls for social, moral, legal, political, and administrative action. The Janani Suraksha Yojana (which provides for a double grant to the family at the birth of a girl child in a government institution) is one small but promising step in this direction. Likewise, provision of home visits in the postnatal period as a part of home-based IMNCI will ensure that girls are also brought under proactive observation. This will ensure better care of newborn girls whose illness, if it occurs, would be identified in time and whose families can be coaxed by providers to seek treatment.

The problem of gender bias against the girl child is very complex and deep-rooted and has to be tackled by the society as a whole at multiple levels. Presently, there is a groundswell of concern in the country to address this prejudice. Neonatal health professionals must also join forces with civil society, lawmakers, government, and conscience-keepers to rid the country of the sin of female feticide and infanticide.

The private sector

India has witnessed a rapid spread of neonatal units in the private sector in towns and cities. Surveys in the past decades have provided reasonable insight into the status of neonatal intensive care units in large tertiary care hospitals. However, very little is known about the quality, strengths, limitations, and potential of these small neonatal units dotting the medium and small cities and towns. These units, consisting of 2-10 beds, are often run by individual pediatricians or obstetrician/pediatrician teams. Together, these small units, rather than the nurseries of large hospitals, may be the biggest segment of functional neonatal inpatient services. Studies are required to assess how the not-so-rich families are utilizing these mini-neonatal units in cities and towns. There is an urgent need to develop norms, standards, and guidelines for these facilities. It may be a good idea for the NNF to develop an accreditation system for mini-NICUs on the pattern of Level II and III nurseries to bolster their credibility and promote quality improvement in newborn care in this vital constituent of the private sector.

The urban neonate

A major gap in our program is the lack of a definite strategy for the urban poor neonate. The focus of government interventions has been largely confined to the rural population, and the focus of the private sector has been the urban middle and upper classes. The health care of newborn infants who are born in urban slums has thus been neglected– an oversight that must be corrected. Close to 30 percent of India's population lives in the cities, and the proportion of poor families in urban areas exceeds that of rural areas.[57] In RCH II, special emphasis will be given to the health of urban poor women and children. There is an

urgent need to document the status of newborn health among the urban poor, to delineate newborn care knowledge, beliefs, and practices, and to map potential resources and develop innovative models of newborn care for urban poor communities.

USAID initiatives and IndiaCLEN studies would provide useful insights into this critical dimension of the newborn health challenge. Additional surveys are needed for determining the country-level scenario in order to develop a strategy for urban newborn health. The NNF can play a major role in improving care in urban slums because a majority of its members come from cities. To begin with, the NNF can help develop citywide neonatal health initiatives for metropolitan areas such as Mumbai, Delhi, Chennai, Kolkata, Bangalore, and Hyderabad.

Breastfeeding promotion

Breastfeeding is the single most important preventive intervention to improve child survial.[28] It has the potential of reducing 13 percent of child deaths in 42 countries with 90 percent of the world's 10.8 million child deaths. The estimate for India is a 16 percent reduction in under-5 mortality.[3] Breastfeeding begins in the newborn period, but interventions for successful breastfeeding are required to be made in the antenatal period, soon after birth, and in the neonatal period, especially the first week life. India has a long way to go with regard to promoting exclusive breastfeeding at six months and continued breastfeeding (6-11 months) thereafter. Presently, only 19 percent of infants receive exclusive breastfeeding in the first six months of life.[18] The government is strengthening efforts to address this priority at multiple levels, and a number of professional bodies are also contributing to breastfeeding promotion in their own spheres of influence. But to really make a difference, these multifarious efforts must converge. A wider alliance (such as the India Breastfeeding Partnership), encompassing health departments, the ICDS system, professional bodies, NGOs, civil society, media and others should be forged. The breastfeeding agenda is too important and too urgent to be left in its present state.

Kangaroo mother care

KMC is an evidence-based modality of care for LBW neonates in resource poor settings.[29] Some initial successes in implementing KMC in the NICU settings have been reported from India. For a country with the largest population of LBW infants, this modality of care could be a boon, but KMC is still a nebulous concept in India. Its feasibility and acceptability in facilities are promising, but community-based experiences are lacking. Whether communities with different cultures would accept this method of mother-craft remains to be seen. SNL has recently provided training to physician-nurse teams from five centers in Bogota, Columbia. As a follow up, KMC demonstration sites are being developed, the KMC India Network established, training materials disseminated, and a website (www.kmcindia.org) launched. These activities, aimed at capacity-building in KMC, would provide a platform for adapting KMC to the Indian context, paving the way for community-based KMC research and implementation in the near future.

Newborn nursing

Newborn nursing is a high priority, as nurses are SBAs. It is the nurses who attend deliveries and provide care to normal, small, and sick neonates in facilities. Pre-service and in-service training of nurses in newborn care needs strengthening. A competency-based, participatory training module (AIIMS) for nurses working at district and subdistrict facilities, a self-learning module on newborn nursing for graduate pre-service training (AIIMS), and a manual of newborn nursing for neonatal nurseries (NNF) meet most of the learning needs in newborn nursing but require a wide dissemination. Manpower needs for nursing in the country need to be assessed.

Education and training

The pre-service, in-service, and continuing education curricula, and teaching materials of other cadres of maternal-neonatal healthcare providers (including specialists, physicians, LHVs, ANMs, AWWs, and TBAs),

need to be reviewed and revised. There is, at present, a better understanding of the competencies in newborn care expected from the key providers. Wherever necessary, the teaching learning methodology should be improved upon. There is a worldwide trend seen in replacing didactic teaching by interactive methods. Learning resource materials need to be contemporary in content and reader-friendly in format.

The recommendations of the NNF and the IAP on neonatology education for undergraduate and postgraduate medical education should be disseminated and implementation monitored.

It will be important to provide in-service training and continuing education to refresh the skills of providers in newborn care. Building on the programs of Indira Gandhi Open University and the Madhya Pradesh government (SATCOM), it is possible to use satellite-based instruction for disseminating neonatal healthcare.

Teaching institutions

Many teaching institutions in India have done very well in promoting newborn health in the country by establishing newborn care services of increasing sophistication, improving and innovating pre-service and in-service education training of physicians and nurses, partaking in the NNPD and conducting other research activities, and by playing a leadership role in respective regions and contributing to the programs of the NNF. However, even today over two-thirds of the 160 medical colleges in the country do not even have Level II neonatal units– a basic requirement recommended by the Medical Council of India to ensure that a reasonable level of neonatal care is provided to inborns or referred neonates and that optimum quality of training of medical students can be ensured. This gap must be bridged by making provision for additional resources, if necessary.

Teaching institutions are expected to be role models in clinical care, research, and education, but many of them have limited faculty strength in pediatrics that makes it difficult for them to provide neonatal services of acceptable standards or run a quality education and research program. Newborn care improves only when a committed and designated individual or group of consultants devote energy and time to develop neonatology as a subspecialty. A policy decision to have designated faculty positions for neonatology in teaching institutions by state health and medical education departments would go a long way in bridging this gap. Newborn services encompass not only neonatal intensive care units and postnatal wards but also the follow-up clinic for high-risk neonates.

A standard database and perinatal-neonatal death auditing should be made a part of normal procedure at tertiary care and teaching institutions.

A working group for teaching institutions (medical and nursing) should be constituted with the aim of developing an action plan to strengthen these institutions for neonatal clinical care services, program support, education, and research.

Promoting evidence-based newborn care practices

There is considerable scope for improving the clinical management of neonates in hospitals in the country, especially in intensive care units. The excessive use of antibiotics, and of oxygen and blood products are just three irrational practices that need to be curbed. But such phenomena are not peculiar to our country. In the West, excessive use of surfactant is widely prevalent, while breastfeeding rates continue to be suboptimal. The NNF has consistently promoted rational neonatal management guidelines through its publications and education activities. The neonatal resuscitation movement resulted in a widespread positive change in resuscitation practices. There are great opportunities for strengthening ongoing educational efforts in order to remain in step with changing knowledge and the evidence base in critical care. The web and communication technologies of the day provide unforeseen possibilities and choices in enhancing the reach, depth, and targeting of messages to professionals and families.

The NNF should develop and launch a comprehensive program to promote best clinical practices for neonates. This program could be called the "Evidence-based Newborn Care Initiative" (ENCI). The roadmap for this initiative needs to be developed through wider consultation and consensus-building. Broadly speaking, the aim would be to develop and disseminate evidence-based clinical and nursing management protocols among physicians and nurses. The initiative would help treating physicians and nurses make the right clinical decisions for their newborn patients. Multi-pronged strategies to disseminate information, including print, web, conferencing, and symposia should be explored, depending upon available resources.

One dimension of this initiative should also be to educate families about best newborn care practices. Frequently asked questions about newborn care and illness could be posted at the NNF website and the concept of local and regional help-lines explored.

In the present information age and with India in the global forefront of information technology, sound information on newborn healthcare should be made as accessible to the providers and families as possible.

Investing in women's health and development

India has a long way to go for social interventions that promote health. The experience in Kerala and Sri Lanka has shown that investments in women's education, empowerment, and development are the key to maternal and child health. The life-cycle approach, incorporating health and nutrition of the girl child and adolescent, will go a long way in preventing maternal and perinatal morbidity and mortality. The importance of this overarching agenda, requiring the convergence of several sectors, is fundamental to the long-term future of the country.

Information and Research

The SRS and the NFHS are excellent sources of information on neonatal-perinatal health in India. However, it has recently been noted that the estimates provided by these systems may be an underestimate of neonatal and, more significantly, of perinatal mortality.[30] The accuracy of documentation of neonatal deaths and stillbirths in the SRS and NFHS surveys needs to be strengthened by improving methodology and by addressing the reluctance on the part of the communities to divulge these events.

There is also a paucity of data on the causes of neonatal and perinatal mortality in the community. The available verbal autopsy protocols are not validated in Indian settings. The Survey of Causes of Deaths (Rural) conducted by the RGI uses the adapted version of the International Classification of Diseases (ICD 10th revision).[31] It provides causes of infant deaths but does not disaggregate the data by neonatal and postneonatal periods. The classification of causes in this survey is also not up to date. For instance, it lists "birth injury" but not "birth asphyxia," "pneumonias" but not "sepsis."

For a vast and diverse country like India, it is important that information on the burden and epidemiology of neonatal-perinatal morbidity and mortality is documented on an ongoing basis from representative populations of rural, urban, and tribal communities of different socio-economic strata. Both primary and contributing causes of neonatal deaths need to be reported on a standard format. Identifying the causes of stillbirths in the community is a largely an uncharted area which should be systematically addressed.

Likewise, more information is required about traditional practices, common morbidities, and care-seeking behavior in the neonatal period.

There are many gaps in the neonatal-perinatal health knowledge base. More than new interventions, research is needed to evaluate delivery approaches for the known interventions. Table 9.2 provides a list of neonatal-perinatal research priorities in India.

Table 9.2 Key research priorities in neonatal deaths in India

Neonatal mortality	• Surveillance of cause-specific neonatal mortality (early and late, urban, rural, tribal) disaggregated by gender and socioeconomic variables
Newborn care practices and care seeking	• Care-seeking behaviors for newborn illness in rural, urban and tribal settings; social autopsy for neonatal sickness and mortality • Traditional newborn care practices in different regions and communities • Interventions to improve care seeking for neonatal illnesses, especially that for the girl child
Models of newborn care program	• Community and home-based newborn care models in rural, urban-poor and difficult-to-reach communities· • Models of neonatal care at district hospitals, FRUs and PHCs. • Models of neonatal-perinatal care for the poor in the private sector with and without provision of health financing mechanisms • PRI participation in newborn health care· • Economic analyses of newborn health interventions implemented at community and facility levels • Use of telemedicine in newborn care in difficult-to-reach areas
IMNCI	• Validation of 0-6 days IMNCI algorithms· • Evaluation of IMNCI strategy in improving newborn care at community and facility levels
LBW	• Trends in the burden of LBW (IUGR and preterm) infants distal and proximate determinants· Etiopathogenesis of IUGR; efficacy of maternal supplementation of single and multiple micronutrients in improving BW • Role of physical work and indoor pollution during pregnancy on BW • Impact of zinc supplementation of LBW infants on morbidity and mortality • Fetal growth standards to classify neonates as appropriate-for-dates, small-for-dates and large-for-dates for clinical and epidemiological use
Maternal infections	• Prevalence of bacterial vaginosis and its association with prematurity and LBW
Neonatal infections	• Principal causative organisms of community-acquired NNS, their antimicrobial sensitivity and molecular epidemiology; surveillance studies to provide ongoing information to guide treatment regimens • Simple clinical algorithms for identification of NNS by health workers • Profile of maternal genital tract flora among Indian mothers and its relation with early asset sepsis • Feasibility of treating NNS with oral and /or injectable antibiotics in the rural and urban slum communities by community-based health workers and private providers· • Simplified regimens for treating neonatal sepsis in the community that avoid or reduce the need for injectable antibiotics
Birth asphyxia	• Effectiveness of TBAs in the management of birth asphyxia with and without using resuscitation devices (tube-mask, bag-mask)
KMC	• Effectiveness of KMC in the community management of LBW infants • Feasibility, acceptability and safety of KMC program in the community implemented by primary care workers/volunteers
Technology advancement	• Use of Uniject™ in treatment of NNS by health workers • Indigenous designing of low cost transport incubator, warmer cot and other essential equipment

Advocacy and Partnerships

Advocacy

Newborn health advocacy in India is an outstanding success story.[32] NNF has played an exemplary role over two decades to bring newborn health to center stage of the child health agenda where it stands today. Through meetings, conferences, and workshops; through publications of programmatic relevance; through education and training efforts oriented to the broader newborn health context; and through a credible track record of building partnerships, the NNF has succeeded in orchestrating a compelling and rewarding advocacy strategy aimed at the policy makers in India. The high point of advocacy was the inauguration of the first National Newborn Week by the Honorable Prime Minister in November 2001.

There is also considerable support for newborn health among the multilateral and bilateral agencies operating in India. Newborn health has a significant visibility in many states. Uttar Pradesh, for instance, is developing a state newborn health strategy. There is however a distinct need to enhance the level of advocacy in many other states. Ultimately, the action is at the state level.

Some additional targets for newborn health advocacy include parliamentarians, the Planning Commission, PRIs, NGOs, women's organizations, and media. Members of Parliament could be approached to support newborn health initiatives through their local area development funds (Rs20 million each) in their respective constituencies. There is also a need to reach out more effectively to co-professionals such as obstetricians, nurses, and public health specialists. It may be a good idea to engage celebrities in promoting newborn health.

Advocacy must be a sustained endeavor, as political and administrative leadership changes from time to time. The context of advocacy also needs continuous refinement. For instance, today the MDG framework is of fundamental importance to the national and international stakeholders; but this was not so until recently. Targets of opportunity must be sought, tracked, and never missed.

Need for establishing a partnership for newborn health

In order to give impetus to newborn health activities in India at this critical juncture, there is a need to establish a broad-based partnership of all stakeholders including not only the government and the NNF, but also women's groups, civil society, media, academics, SM champions, bilaterals, multilaterals, and members of professional societies such as the IAP, the IMA, the FOGSI, the ISOPARB, the TNAI, and the BPNI. [Such a partnership could be called the Healthy Newborn Partnership of India (HNP-India) or the India Newborn Health Alliance (India-NEHA)]. The NNF could take the lead in playing the role of a catalyst and a coordinator, but the running of the partnership should be flexible and participatory. Similar arrangements could be replicated as state chapters of the partnership, especially in states which account for the largest burden of newborn mortality.

The main objective of the partnership should be to provide support to the RCH program at all levels. Other objectives could be to share ideas and experiences and undertake strategic planning and advocacy initiatives.

Epilogue

Neonatal health is the foundation of child and adult health. A healthy start to life depends upon the health of the mother and the care that she and her baby receive before, at, and after birth. ENC is the gateway to human survival, health, and development. Every baby born in this country has the right to life and to the highest possible level of health. Evidence-based interventions, if taken to scale, can save millions of newborn

lives in the country in the next few years. Translating knowledge into action is the key to meeting this challenge and realizing the quest. And a resurgent India can do it! India is at the threshold of an unprecedented economic growth and aims to attain the status of a developed nation by 2020.[33]

Attainment of the global MDG of reducing child mortality by two thirds by 2015 from the 1990 baseline is dependent on at least a 50 percent-reduction in neonatal deaths worldwide from the present level.[34] Because India contributes the largest share, around 30 percent, to the global burden of neonatal deaths, she must set an example for the rest of the developing world by achieving a major breakthrough in neonatal survival. And there is a national policy mandate to do so. The NPP (2000) explicitly recognizes the importance of neonatal health and the Tenth Plan lays down state- and country-specific targets for the NMR for the year 2007. The promising beginning made in the CSSM program and the first phase of the RCH program can now be maximized in the second phase of the program (2005-10), as a comprehensive newborn health initiative integrating SM and CS approaches, employing a mix of family-centered, population-oriented, and facility-based interventions in public and private sectors. The RCH II program plans envisage a comprehensive roadmap to make the next few years a watershed for maternal-neonatal health.

Thus, for India the commitment to newborn health and survival has been made, the goals are defined, and action is accelerating.

The vision for newborn health in India is ambitious yet achievable. It is time to orchestrate a national effort to accomplish the newborn health mission, a mission to be steered by an alliance of government, providers, professionals, academia, civil society, program managers, and development partners. This mission will be equity-driven, will strive to remove gender disparity in perinatal-neonatal care, and by 2015 this mission will help place India in the category of proud nations with low newborn and child mortality.

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Low birth weight

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Major neonatal disorders

Neonatal sepsis

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9 Gaps and the Way Forward

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Annexes

Annex 1 India Fact Sheet

Economy

- Human Development Index ranking[1]	127 of 177 countries
- Proportion of population below poverty line	
National poverty line[2]	
o Combined	26.10%
o Rural	27.09%
o Urban	23.62%
International poverty line[1]	
o US 1 Dollar a day	34.7%
- Gross National Income per capita[3]	2570 PPP* US Dollars
- Gross Domestic Product per capita[1]	2670 PPP* US Dollars
- Average annual percent growth of GDP[3]	4.4%
- Health expenditure (as % of GDP)[1]	
o Total	5.1%
o Public	0.9%
o Private	4.2%
- Private out of pocket expenditure (% of total expenditure on health	82.1%
- Per capita total expenditure on health[4]	
o At average exchange rate	24 US Dollars
o International Dollar	80 Dollars
- Per capita Government expenditure on health[4]	
o At average exchange rate	4 US Dollars
o International Dollar	14 Dollars
- External resources for health as % of total expenditure on health[4]	0.4%
- Physicians per 100,000 population[1]	51

Demography

- Population[5]	
o Combined	1027 million
o Rural	741.7 million
o Urban	285.4 million
o Males	531.3 million
o Females	495.7 million
- Average annual population growth[5]	2.15%
- Birth rate[6]	
o Combined	25.0
o Rural	26.6
o Urban	19.1
- Crude death rate[6]	
o Combined	8.1
o Rural	8.7
o Urban	6.1
- Sex ratio[5]	933 females per 1000 males

Maternal, newborn and child health	
Under 5 mortality rate[7]	94.9 (per thousand live births)
Under 5 mortality rank[8]	53 of 193 countries
Infant mortality rate[6]	64.0 (per thousand live births)
Neonatal mortality rate[9]	44.4 (per thousand live births)
Early neonatal mortality rate[9]	32.0 (per thousand live births)
Life expectancy at birth[8]	64 years
Maternal mortality ratio[7]	540 (per thousand live births)
Institutional delivery rate[7]	33.6%
Births within 24 months of a previous birth[7]	28.3%
Births with medical antenatal care[7]	65.2%
Births with antenatal care in first trimester[7]	33.0%
Births with medical assistance at delivery[7]	42.3%
Births in a medical facility[7]	33.6%
Children 12-23 months fully vaccinated[7]	42.0%
Nutrition	
- Low birth weight rate(1998-2000)[8]	30.0%
- Proportion of under-5 children suffering from moderate and severe under weight[8]	47.0%
- Children under 4 months who are exclusively breastfed[7]	37%
Education	
- Literacy rate[5]	
o Total	65.4%
o Males	76.0%
o Females	54.3%
- Net primary school enrollment/attendance (1996-2002)[8]	76%
- Adult literacy rate: females as % of males[8]	66%
- Gross enrollment ration:females as % of males[8]	
o Primary school	83%
o Secondary school	70%

GDP – Gross Domestic Product

** Purchasing Power Parity (PPP): this refers to a rate of exchange that accounts price differences across countries, allowing international comparison of real output and incomes.*

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Annex 2 Child, Infant, and Neonatal Deaths

Child, infant and neonatal deaths around the year 2000

Indicator	Value	Reference Year(s)
Population[1]	1,010 million	2000
Birth rate[2,3]	25.8 per 1000 population	2000
Estimated number of live births per annum	26.06 million	2000
Under-5 child mortality rate[4]	95 per 1000 live births	1993-98
Estimated number of under-5 child deaths[5]	2.4 million	2000
Infant mortality rate (IMR)[2]	68 per 1000 live births	2000
Estimated number of infant deaths	1.77 million	2000
Neonatal mortality rate (NMR)[2]	44.4 per 1000 live births	2000
Estimated number of neonatal deaths	1.16 million	2000

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Annex 3 State-wise Mortality Rates

State-wise neonatal, infant and under-five child mortality rates (per 1000 live births)

State	SRS		NFHS II1998 – 99[3]		
	IMR 2002[1]	NMR 2000[2]	NMR	IMR	U-5MR
India	**64**	**44.4**	**43.4**	**67.6**	**94.9**
Andhra Pradesh	62	45	43.8	65.8	85.1
Assam	70	47	44.6	69.5	89.5
Bihar	61	42	46.5	72.9	105.1
Gujarat	60	42	39.6	62.6	85.1
Haryana	62	38	34.9	56.8	76.8
Himachal Pradesh	58	31	22.1	34.4	42.4
Karnataka	55	40	37.1	51.5	69.8
Kerala	10	10	13.8	16.3	18.8
Madhya Pradesh	85	59	54.9	86.1	137.6
Maharashtra	45	33	32.0	43.7	58.1
Orissa	87	61	48.6	81.0	104.4
Punjab	51	29	34.3	57.1	72.1
Rajasthan	78	49	49.5	80.4	114.9
Tamil Nadu	44	36	34.8	48.2	63.3
Uttar Pradesh	80	53	53.6	86.7	122.5
West Bengal	49	31	31.9	48.7	67.6
Delhi	32	NA	29.5	46.8	55.4
Jammu & Kashmir	47	NA	40.3	65.0	80.1
Arunachal Pradesh	40	NA	41.8	63.1	98.1
Manipur	17	NA	18.6	37.0	56.1
Meghalaya	60	NA	50.7	89.0	122.0
Nagaland	NA	NA	20.1	42.1	63.8
Sikkim	39	NA	26.3	43.9	71.0
Goa	19	NA	31.2	36.7	46.8

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Annex 4 Burden of Neonatal Deaths

State-wise burden of neonatal deaths in India

	Crude birth rate[1] (per 1000 population)	Population in millions[2] (1999-2000)	Estimated births	Neonatal mortality rate[1] (per 1000 live births)	Estimated neonatal deaths
Andhra Pradesh	21.30	75.47	1,607,511	45.00	72,337
Assam	26.90	26.20	704,780	47.00	33,124
Bihar	31.90	99.92	3,187,448	42.00	133,872
Gujarat	25.20	48.25	1,215,900	42.00	51,067
Haryana	26.90	19.84	533,696	38.00	20,280
Himachal Pradesh	22.10	6.71	148,291	31.00	4,597
Karnataka	22.00	52.10	1,146,200	40.00	45,848
Kerala	17.90	32.26	577,454	10.00	5,774
Madhya Pradesh	31.20	79.76	2,488,512	59.00	146,822
Maharashtra	20.90	91.12	1,904,408	33.00	62,845
Orissa	24.30	35.86	871,398	61.00	53,155
Punjab	21.50	23.52	505,680	29.00	14,664
Rajasthan	31.20	53.55	1,670,760	49.00	81,867
Tamil Nadu	19.20	61.78	1,186,176	36.00	42,702
Uttar Pradesh	32.80	170.11	5,579,608	53.00	295,719
West Bengal	20.60	79.01	1,627,606	31.00	50,455
India	**25.80**	**997.13**	**25,725,954**	**44.00**	**1,131,941**

NB: This table forms the basis for Figure 1.4.

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Annex 5 Early Neonatal Mortality Rates

Early neonatal mortality rates (per 1000 live births), by residence, India, and larger states

India and the larger states	Early neonatal mortality rate		
	Total	Rural	Urban
India	32	35	19
Andhra Pradesh	35	39	22
Assam	31	32	16
Bihar	31	32	20
Gujarat	31	32	20
Haryana	33	38	20
Himachal Pradesh	26	27	12
Karnataka	31	37	14
Kerala	6	7	4
Madhya Pradesh	44	46	32
Maharashtra	23	26	16
Orissa	45	47	27
Punjab	18	20	11
Rajasthan	33	35	21
Tamil Nadu	25	29	16
Uttar Pradesh	41	43	29
West Bengal	21	23	12

Reference

Registrar General of India. Sample Registration System (SRS) Statistical Report 2000. New Delhi: 2004. (Under publication)

Data from 32,393 births

Annex 6 Trends in Mortality Rates

Trends in infant morality rate, neonatal morality rate and post-neonatal mortality rate (per 1000 live births)

Year	Infant mortality rate			Neonatal mortality rate			Post-neonatal mortality rate		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
1971	129	138	82	75.2	80.6	45.4	54.2	57.4	36.6
1972	139	150	85	71.6	76.6	44.9	68.2	73.4	40.1
1973	134	143	89	68.2	72.1	47.5	66.2	70.8	41.4
1974	126	136	74	70.1	75.7	44	55.8	60.2	32.9
1975	140	151	84	78.3	84.3	46.2	62.1	66.7	37.8
1976	129	139	80	77	83	49	52	56	31
1977	130	140	81	80.2	88	42	49.8	52	39
1978	127	137	74	77.4	85.2	38	49.6	51.8	36
1979	120	130	72	71.7	77.7	42.4	48.3	52	29.8
1980	114	124	65	69.3	75.5	39.1	44.6	18.3	26.1
1981	110	119	63	69.9	75.6	38.5	40.5	43.5	24
1982	105	114	65	66.7	72.9	38.8	38.1	40.8	26.4
1983	105	114	66	67.2	73.6	39.3	37.7	40.2	26.5
1984	104	113	66	65.8	72.2	39.7	38.2	41.1	26.4
1985	97	107	59	60.1	66.6	33.3	37.1	39.9	25.6
1986	96	105	62	59.8	65.5	36.2	36.6	39.1	25.8
1987	95	104	61	57.7	63.6	33.3	37.7	40.5	27.3
1988	94	102	62	56.8	62	34.6	37.7	40.1	27.5
1989	91	98	58	56.4	62.1	31.4	34.5	36.4	26.3
1990	80	86	50	52.5	57.4	30.9	27.2	28.9	19.5
1991	80	87	53	51.1	55.4	32.2	29.3	31.3	20.6
1992	79	85	53	50	53.6	33	29.4	31.4	20
1993	74	82	45	47.1	52.3	28.4	25.5	28.2	15.8
1994	74	80	52	47.7	52	32.6	26	27.5	19.6
1995	74	80	48	48.1	52.3	29.2	25.9	27.5	19
1996	72	77	46	47	50	28	25	27	17
1997	71	77	45	46.1	50.5	26.2	25.1	26.5	19
1998	70	75	44	45.1	49	27	26.5	28.4	17.9
1999	70	75	44	44.8	49.2	27.7	23.9	25.9	16.1
2000	68	74	43	44.4	48.7	27.5	23.4	25.3	16.1
2001	66	72	42	Not available					
2002	64	69	40						

SRS Data

Annex 7 Antenatal Care and Delivery

Distribution of antenatal care coverage, institutional births, skilled attendance by state

State	Proportion (%) who received all recommended types of antenatal care[1]	Proportion (%) of births delivered in a medical institution	Proportion (%) of deliveries assisted by a health professional[2]
India	20.0	33.6	42.3
North			
Delhi	32.8	59.1	65.9
Haryana	20.8	22.4	42.0
Himachal Pradesh	30.2	28.9	40.2
Jammu & Kashmir	30.7	35.6	42.4
Punjab	31.7	37.5	62.6
Rajasthan	8.3	21.5	35.8
Central			
Madhya Pradesh	10.9	20.1	29.7
Uttar Pradesh	4.4	15.5	22.4
East			
Bihar	6.4	14.6	23.4
Orissa	21.4	22.6	33.4
West Bengal	19.7	40.1	44.2
Northeast			
Arunachal Pradesh	17.3	31.2	31.9
Assam	15.8	17.6	21.4
Manipur	18.3	34.5	53.9
Meghalaya	10.4	17.3	20.6
Mizoram	13.5	57.7	67.5
Nagaland	8.9	12.1	32.8
Sikkim	15.3	31.5	35.1
West			
Goa	60.6	90.8	90.8
Gujarat	25.0	46.3	53.5
Maharashtra	31.0	52.6	59.4
South			
Andhra Pradesh	35.6	49.8	65.2
Karnataka	41.5	51.1	59.1
Kerala	64.9	93.0	94.0
Tamil Nadu	50.8	79.3	83.8

Note: Table includes only the two most recent births during the three years preceding the survey.

[1] Three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), two or more

[2] Doctor, auxiliary nurse midwife, nurse, midwife, lady health visitor, or other health professional

Reference

Indian Institute of Population Studies. National Family Health Survey (NFHS-2) 1998-99. Mumbai: 2000.

Annex 8 Place of Delivery

Rural-urban and socio-economic differential in place of delivery (percent distribution)

Characteristic	Health facility/institutions				Home			Other
	Public	NGO/ Trust	Private	Total	Own	Parents	Total	
Place of residence								
Rural	12.5	0.5	11.6	**24.6**	60.5	13.8	**74.3**	1.0
Urban	29.1	1.5	34.5	**65.1**	27.6	6.3	**33.9**	1.0
Caste/tribe								
Scheduled caste	16.0	0.5	10.3	**26.8**	60.1	12.0	**72.1**	1.1
Scheduled tribe	10.7	0.7	5.7	**17.1**	70.4	11.4	**81.8**	1.1
Other backward classes	16.3	0.8	19.0	**36.1**	49.8	13.0	**62.8**	1.1
Other	17.9	0.9	21.3	**40.1**	47.1	11.9	**59.0**	0.9
Standard of living index								
Low	11.9	0.4	6.2	**18.5**	66.1	14.2	**80.3**	1.2
Medium	18.1	0.8	16.0	**34.9**	51.8	12.3	**64.1**	1.0
High	20.3	1.1	43.2	**64.6**	27.6	7.0	**34.6**	0.7
Mother's education								
Illiterate	10.2	0.4	6.8	**17.4**	68.1	13.4	**81.5**	1.1
Literate (<middle school)	23.3	1.1	19.0	**53.4**	42.3	13.4	**55.7**	0.9
Middle school complete	28.5	1.0	25.6	**55.1**	32.8	11.1	**43.9**	
High school & above	24.2	1.5	49.3	**75.0**	17.9	6.4**24.3**	0.7	1.1
Total	16.2	0.7	16.7	**33.6**	53.2	12.2	**65.4**	1.0

Data from 32,393 births

Reference

Indian Institute of Population Studies. National Family Health Survey (NFHS-2) 1998-99. Mumbai :2000.

Annex 9 Assistance During Delivery

Rural-urban and socio-economic differential in assistance during delivery (percent distribution)

Characteristic	Skilled attendant				TBA	Other	Missing
	Doctor	ANM/ nurse/ midwife/ LHV	Other health professionals	Total			
Place of residence							
Rural Urban	23.0	9.8	0.7	**33.5**	39.6	26.6	0.3
Caste/tribe	55.8	17.2	0.3	**73.3**	18.8	7.6	0.2
Scheduled castes	23.5	12.1	1.2	**36.8**	37.7	25.1	0.5
Scheduled tribe	14.5	8.3	0.2	**23.0**	44.4	32.2	0.5
Other backward classes	31.8	12.3	0.8	**44.9**	34.9	19.9	0.3
Other	37.7	11.3	0.3	**49.3**	31.4	19.5	0.2
Standard of living							
Low	15.8	8.5	1.1	**25.4**	43.5	30.7	0.5
Medium	31.1	12.8	0.4	**44.3**	34.3	21.1	0.3
High	60.9	14.5	0.3	**75.7**	17.5	6.8	0.1
Mother's education							
Illiterate	15.6	9.0	0.8	**25.4**	44.7	29.6	0.4
Literate (<Middle School)	37.3	15.4	0.4	**53.1**	28.4	18.1	0.3
Middle school complete	49.5	17.1	0.3	**66.9**	21.0	11.7	0.3
High school & above	70.3	12.9	0.2	**83.4**	11.8	4.7	0.1
Total	**30.3**	**11.4**	**0.6**	**42.3**	**35.0**	**22.4**	**0.3**

Reference

Indian Institute of Population Studies. National Family Health Survey (NFHS-2) 1998-99. Mumbai :2000.

Annex 10 Resources

Listing of Available Resource Materials on Newborn Health in India

National Neonatology Forum

Recommendations/Monographs

- Recommendations on Neonatal Care in India (1981)
- Education and Training in Neonatology (1981)
- Minimum Perinatal Care: Report of a task force (1982)
- Accreditation of Neonatal Units (1989)
- Neonatal Nomenclature and Data Collection (1989)
- Neonatal Monitoring (1990)
- Biomedical Equipment: status and perspective (1990)
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- Traditional Practices in Newborn Care (1991)
- Communication Strategies for Newborn Care (1993)
- Education and Training in Neonatal Nursing (1993)
- Manual of Newborn Nursing (1993)
- National Neonatal Perinatal Database Report (1995)
- Undergraduate Curriculum in Neonatology (1997)
- Teaching Aids on Newborn Care (1998)
- Recommendations on DM course (2000)
- National Neonatal Perinatal Database Report (2000)
- Newborn Health: Key to child survival (2000)
- District Training Module - RCH program (4 volumes) (2001)
- Training Module for the Basic Health Worker (2002)

Quarterly Publications

- NNF bulletin (1987-1999)
- Journal of Neonatology (1999 onward)

State Chapters

- TBA training module (WB Chapter)
- ANM training module (Gujarat Chapter)
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WHO/SEARO

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SEARCH

- Training Module for Village Health Workers
- Training module for TBAs
- Film on home-based newborn care

SWACH

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- Technical Reference Manual for Management of Birth Asphyxia at Home and Maternity Facility Levels
- Birth Asphyxia: A guide for maternity facility staff

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- Newborn Care in South East Asia: current status and priorities (1999)
- Practical Procedures for Newborn Nursery (2001)
- Newborn Care Training and Operationalization Modules (Orissa, MP, WB) (1998-2000)
- Training module on Essential Newborn Nursing for Small Hospitals

India KMC Network

- Resource materials
  - Practice guidelines
  - Video
  - Information sheet for parents
  - Poster

Other

- Gujarati handbook on newborn care for lay people (S N Vani)
- Gujarati handbook on newborn care for health workers (S N Vani)
- Slide set for newborn skills (S N Vani) Home-based Life Saving Skills (Mother and Baby)
- Flip chart on newborn care (Chetana)

Text books

- Care of the Newborn (Meharban Singh); Sagar Publications, 1999
- Neonatology: Principles and practice (DK Guha); Jaypee Brothers, 1997
- Neonatal Equipments: Everything you need to know (A.K. Deorari and V.K. Paul); Sagar Publications, 2002

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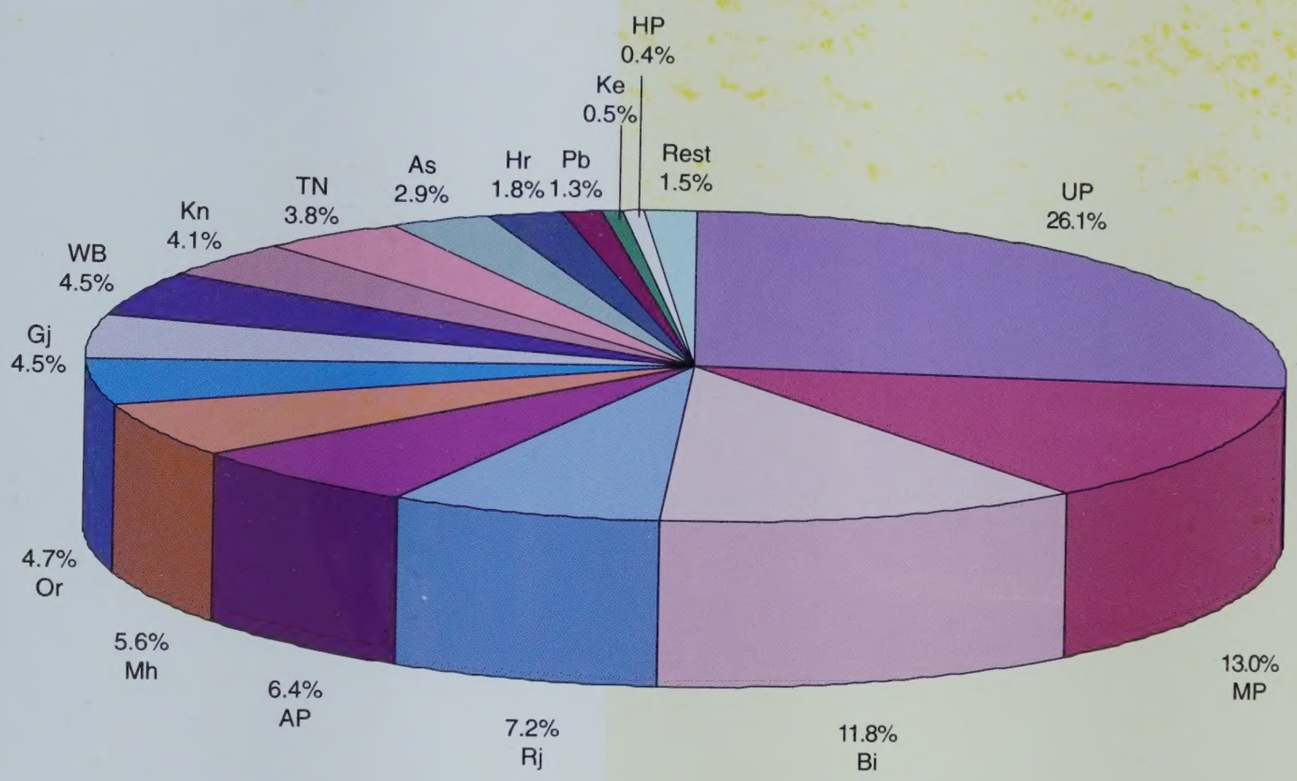
India: State-wise Burden of Neonatal Deaths



UP: Uttar Pradesh; MP: Madhya Pradesh; Bi: Bihar; Rj: Rajasthan; AP: Andhra Pradesh; Mh: Maharashtra; Or: Orissa; Gj: Gujarat; WB: West Bengal; Kn: Karnataka; TN: Tamil Nadu; As: Assam; Hr: Haryana; Pb: Punjab; Ke: Kerala; HP: Himachal Pradesh

[N.B.: The data of UP, MP, and Bi in this figure refer to the year 2000 before these states were divided. Three new states of Uttaranchal, Chhattisgarh and Jharkhand were carved out of UP, MP and Bi, respectively. Population and IMR (per 1000 live births) of the present states are as follows: UP: population 166.1 million, IMR 80; Uttaranchal: population 8.5 million, IMR 44; MP: population 60.4 million, IMR 85; Chhattisgarh: population 20.8 million, IMR 73; Bihar: population 82.9 million, IMR 61; and Jharkhand: population 26.9 million, IMR 58. The NMR estimates after reorganization of these states are not available as yet. The newly created states represent a smaller fraction of the original states, with lower or similar IMR. Thus, even the present, truncated UP, MP, and Bihar continue to carry the highest burden of infant mortality, and therefore, by implication, neonatal mortality. (Data on population and IMR provided in this note are taken from Census 2001[2] and SRS 2002[8], respectively.)]

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